

**Papers presented at the**

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**FAO/JAPAN EXPERT CONSULTATION ON THE DEVELOPMENT  
OF COMMUNITY-BASED COASTAL FISHERY MANAGEMENT SYSTEMS  
FOR ASIA AND THE PACIFIC**

Volume 1

Kobe, Japan, 8-12 June 1992

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AT THE FAO/JAPAN EXPERT CONSULTATION ON THE DEVELOPMENT OF  
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## PREPARATION OF THE DOCUMENT

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### ABSTRACT

Effective management of small scale fisheries is an extraordinarily difficult task. Community-based approaches to management appear to offer important opportunities in certain situations. Extensive experience of such approaches in Japan provides valuable lessons of both the difficulties and the opportunities for this approach. The Consultation examined these experiences, as well as others in the Asia and Pacific region. It identified the critical factors that facilitate or constrain community-based management; it identified guiding principles for the adoption and implementation of such systems; and it made proposals for short and long term projects and programmes to encourage increased use of community-based approaches.

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## SNAPPER FISHING BY ROTATION

by

Ose Red Snapper Fishery Council  
Yamagata Prefecture, Japan

### ABSTRACT

The paper describes the steps taken by a fisheries cooperative to regulate effort upon a high value fishery for snapper. With a very restricted fishing ground, there was considerable competition among vessels to obtain the best positions; serious problems also arose from gear entanglements. In 1960, a special snapper council was created by the cooperative and a series of management measures adopted designed to avoid overcrowding on the grounds. In particular, vessels were organized into groups which were permitted to operate on a rotation system; limitations were also imposed on the commencement and termination of fishing operations. These regulations have succeeded in bringing order into an otherwise chaotic situation. Further measures, based on better scientific advice, are needed, however, in order to more efficiently and rationally manage the fishery and to protect juvenile fish.

### 1. The Area

The Red Snapper Fishery Council is located in Onkai, a typical fishing village with population of 14,800 on the southern coast of Yamagata Prefecture. The coast has a number of large and small reefs, some artificial, and is a suitable fishing ground for snappers, rockfish, sea bass and yellowtail. The largest reef, Ose, 18 km length from north to south, is located 9 miles from the coast (see Appendix).

### 2. Fisheries in the Area

Yamagata Prefecture has a relatively short coast line and its total catch amounts to 12,000 tons valued at US\$ 40 million per year. In terms of value, squids rank top, followed by salmon, snappers and flounders in that order. The Prefecture has only one fisheries cooperative with 1,530 regular members and 1,185 associate members. The Snapper Council has 226 members from the Onka branch and 324 from The Nenjuseki branch. The total number of boats is 234, mostly less than 5GT. They are engaged in trawling, longlining, gillnetting, pole and line fishing and seining. In 1980, the total catch was 211 tons valued at about US\$ 10 million. Snapper catch ranges 60/90 tons per year valued at US\$ 1/1.7 million.

### **3. History of Snapper Fishery**

Snapper floating longline fishery is targetted on spawning schools of snapper coming to the Ose reef at night. At night snapper come up close to the surface and are then caught with floating longlines set vertically to the current. This fishery was started about 100 years ago. Before the War, 27/28 boats were fishing for snappers with this method. After the War, the main fishing was for sardine and mysid, but when the sardine school disappeared in late 1950s, snapper fishing was resumed. With a restricted fishing ground, there was considerable competition among the fishing boats to obtain the best position and many problems were caused by gear entanglement at night.

In order to rectify the situation, in 1960 representatives from seven fishing districts set up the Red Snapper Fishery Council to introduce orderly fishing rules which are still in force.

### **4. Current Management Practices**

The fishing ground is in coastal waters of less than 70 m depth and ranges 3.3 km from north to south and 1 km from the shore. It can accomodate 40-45 boats. However, the best fishing ground is in the centre which can accomodate only 20 boats. The following measures were therefore adopted to avoid overcrowding of the limited fishing area.

- (1) The boats are grouped according to the fishing villages. If there are less than 30 boats they are organized into four groups, each of which engages in a full day fishing, rotating the fishing grounds every day. If there are more than 30 vessels, they are placed into 3 groups and only 2 groups can engage in fishing with the other group resting in turn. A new entry can only fish at the edge of the central fishing ground.
- (2) Boats must arrive at the fishing ground by 18:30 hours. If a boat misses the deadline it can operate only outside of the central fishing ground. They must keep a 50 m distance between the boats and start fishing at 19:30 hours deploying lines at more or less the same speed. Lines are hauled in at 20:00 hours until 15 May, 20:15 hours by 30 May and 20:30 hours from 1 June. The second fishing period commences at 2:30 hours during May and 2:00 hours after June. Hauling of lines commences after 3:30 hours. When lines get entangled with others, the boat must cut its own line and not the others if they cannot be disentangled.
- (3) Only specified fishing lines should be used.
- (4) For fishing operations, specified lighting and buoys should be used.
- (5) In order to avoid poaching before the fishing season commences, two boats in turn must keep watch over the Ose reef.
- (6) Those who violate the above rules must pay a fine not exceeding Yen 10,000.

## **5. The effects of the management**

The above rules have brought order to the otherwise chaotic fishing activity. However, it is doubtful whether they have succeeded to rationally manage the resource. Unfortunately, biological information on this resource is still scarce.

## **6. Future management issues**

1. There is a need to introduce controls, based on a sound scientific basis, on the fishing effort on spawning schools of snapper.
2. It is doubtful whether releasing snapper fries into the sea can contribute to increase the stock. It is considered better instead to prohibit fishing methods such as bottom trawling which catch juvenile fish.
3. Snapper can grow rapidly up to 10 years old. Therefore, efforts should be made to catch more mature fish.
4. Since snapper is caught not only by floating longlines but also by trawling, setnets, gillnets and pole and line, the catch statistics from all those fisheries must be consolidated and analyzed in accordance with the cohort model to increase biological knowledge of this species.

# Appendix

Figure 1: The map of the region

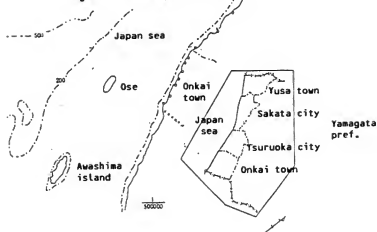
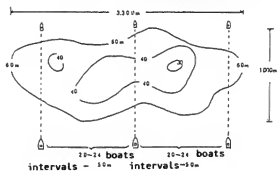


Figure 2: Ose reefs and deployment of fishing vessels



## A COLLECTIVE FISHING OPERATION FOR REEF ANGLING FISHERIES

by

The Mugi Higashi Fisheries Cooperative Association  
Tokushima Prefecture, Japan

### ABSTRACT

A major fishery carried out by the Mugi Higashi FCA on Shikoku Island, Japan, relates to angling for horse mackerel on artificial reefs made of concrete blocks and vessels hulks. The number of angling vessels increased to such an extent that the reef areas became overcrowded, leading to inefficient competition for the best fishing points, collisions between vessels and rising fuel costs. The Cooperative therefore introduced a Collective Fishing Operation Scheme to manage the fishing system. The scheme provided for the reduction by two thirds of the vessels permitted to fish on the reef areas and the formation of the fleet into operational units of 9 vessels each. The appointed fleet commander each day, after having first surveyed the fish school distribution, directs the units into a fishing formation, each vessel being moored fore and aft into a fixed position; these positions are changed daily to ensure equitable treatment. Revenue from sale of the catches is distributed to each vessel, and shared among crew members, through a pool account system. Guard vessels patrol and protect the reefs from the activities of purse seiners. The scheme has enabled fishing operations to be carried out in a orderly, reduced cost, fashion and has promoted among the fishermen an understanding and acceptance of the need for cooperation in fisheries management. Although certain problems remain to be resolved, the experience has demonstrated that fisheries based upon fishing rights and their attendant institutional arrangements are much easier to manage than free entry fisheries.

### 1. Description of the Area and the Fisheries

The Mugi Higashi Fishermen's Cooperative Association (Mugi Higashi FCA) is located in Mugi city in the Tokushima Prefecture of Shikoku island, facing the Pacific Ocean. The total population of Mugi city has gradually decreased from 10,568 in 1955 to 7,793 in 1984. There were 4,082 people working in the city in 1984 of which 34% were engaged in primary industry and the rest in secondary and tertiary industries. In terms of value of production, fishery accounts for 68% (1,367 million Yen) of the total of primary industry. However, in terms of number of people working in the primary industry, it accounts for only 15%.



There are 4 fishermen's cooperative associations (FCAs) in Mugi city. There have been considerable efforts to amalgamate these four FCAs in order to avoid unnecessary competition among the member fishermen in limited small sea areas they share under common fishing rights.

The fishermen are mostly engaged in angling, longline, set net and collecting of shellfish and seaweed by using small boats of less than 5 gross tons. In addition, there are a few off-shore trawl vessels of over 10 GT. Thus, the fisheries in Mugi city are essentially coastal operations.

Mugi Higashi FAC, one of the four FCAs in Mugi city, has 377 members (364 households) comprising 207 regular members (190 households) and 170 associate members (174 households). The membership qualification for regular members is that they must be residents in the area and engaged in fisheries more than 120 days a year. Associate members are those who reside in the area but are not engaged in fisheries more than 120 days a year in the locality: most of them are crews of distant-water fishing vessels and part-time fishermen. They do not have voting right.

At December 1984, a total of 314 fishing vessels, owned by member fishermen of the Cooperative, were used to catch abalone, conger pike, "hijiki" (seaweed) and leather jacket. 80% of the vessels are made of FRP. Production decreased about 40% from 1,029 ton in 1976 to 616 tons in 1984. However, in terms of value, it has not decreased so greatly due mainly to increased prices. Accordingly, the total production value has been maintained at about 650 to 780 million Yen a year.

The characteristic feature of fisheries during this period is that angling which accounted for 60% of total production of all fisheries in terms of quantity in 1976 decreased to only about 14% in 1984. The main species caught by angling is horse mackerel, whose catch sharply decreased to less than 4 tons in 1984.

## 2. The Angling Fishery for Horse Mackerel

Angling can be done without having licenses. It is a free fishery under Japanese legal system. The object of fisheries management in Mugi Higashi FCA is angling for horse mackerel (*Trachurus japonicus*). It is operated by fishing vessels of 1 to 5 tons class in winter season.

From about 1950 onwards, artificial reefs made of concrete blocks and scrapped vessel hulks were sunk by the members of Mugi Higashi FCA in the waters adjacent to the cooperative off Dewajima island, Tsushima island and Oshima island, outside of common fishing right areas, in order to prevent trawlers and fishing in these waters. Migratory species such as mackerel (*Scomber japonicus*) and horse mackerel (*Trachurus japonicus*), etc., began to congregate around these reefs.

Gradually, angling vessels of other prefectures such as of Kochi and Wakayama, started to fish in the reef areas and recorded good catches. Seeing this development, the Mugi Higashi FCA fishermen began to participate in the angling fishery in the same man-made reef areas. Thus, the number of angling vessels fishing there continued to increase until 1975 when as many as nearly 150 vessels gathered in the area and engaged in fishing operations, resulting in over competition. Most of the vessels were small, less than 5 gross tons each with one crew on board.

In 1976, Mugi Higashi FCA adopted a Collective Fishing Operation Scheme for angling in the area. The number of vessels participating in this fishery was reduced from about 130 to 40. The number of crews on board was increased from 3 to 5 per vessel.

Production of horse mackerel by angling increased for the first two years after introduction of collective fishing operation scheme in 1976 but has since decreased (Table 1).

There are management study groups in the Mugi Higashi FCA for each type of fisheries. One of these is the Horse Mackerel Angling Management Study Group to which 110 regular members out of the total 207 are members. Though production has decreased in recent years, horse mackerel fishing is still considered as an important fishery in the cooperative.

YEAR	PRODUCTION OF HORSE MACKEREL BY ANGLING		TOTAL PRODUCTION OF ALL FISHERIES		PERCENTAGE		PRICE OF HORSE MACKEREL
	QUANTITY (in ton) (a)	VALUE (in 000'Y) (b)	QUANTITY (in ton) (A)	VALUE (million Y) (B)	a/A (%)	b/B (%)	b/a Yen/kg
1975	88.7	28,473		510		5.6	321
1976	124.2	59,368	1,029	650	12.1	9.1	478
1977	139.8	107,925	996	780	14.0	13.4	772
1978	64.0	55,424	766	660	8.4	8.3	866
1979	72.5	74,893	752	680	9.6	11.0	1,033
1980	95.3	98,921	909	720	10.5	13.9	1,038
1981	31.0	31,744	873	670	3.6	4.8	1,024
1982	53.2	67,245	720	690	7.4	9.7	1,264
1983	20.1	15,216	633	660	3.2	2.3	757
1984	3.9	3,459	616	670	0.6	0.5	887

### 3. Management of the Horse Mackerel Angling Fishery

As already described, about 150 horse mackerel angling vessels congregated around the artificial reefs and operated fishing by 1975, competing to secure better angling positions in the small fishing area. Such over-crowding often led to collisions of the vessels and other accidents. Further, use of fuel oil increased because of competition to secure better fishing positions.

It was under such circumstances that, headed by one of the pioneering leaders of Horse Mackerel Angling Management Study Group, the Collective Fishing Operation Scheme was devised by the Mugi Higashi FCA in 1976. This fishing scheme attempts

to organize horse mackerel angling vessels fishing in artificial reef areas in the following manner.

- (a) One vessel one crew operations are banned. The horse mackerel angling must be operated by more than 3 crew per vessel. By adopting this operation scheme, the total number of horse mackerel angling vessels was reduced by two thirds.
- (b) A commander vessel is selected from among the total participating vessels by general agreement of the Horse Mackerel Angling Management Study Group. The term of office of the commander vessel of the fleet is, in principle, two years. Further, fishing operation units consisting of 9 vessels must be formed each with a designated leader.
- (c) During the fishing season, fishing operation hours are limited to 07:00 hours to 15:00 hours from Sunday to Friday. Fishing is prohibited on Saturdays.
- (d) The fishing vessel deployment and operation form shall be as follows. First, the commander vessel of the entire fleet leaves the port early in the morning and determines the fishing area of the day after making surveys for fish school distribution around the man-made reef areas. After this, the commander vessel directs the fleet into a formation by 7 o'clock in the morning. The formation shall be that all the vessels come to the area and cast the anchors. They form two or three lines at 5 meter intervals, mooring each other front, rear, left and right. Fishing vessels from other regions or prefectures take part in the formation by making similar lines on both sides of the fleet. This means that the position of each vessel is fixed. Naturally, it may result in differences in catches by the position of the vessel. Therefore, the positions of each fishing operation unit in the fleet as well as positions of vessel within the unit are changed every day by agreement of the operation unit leaders. At 3 o'clock in the afternoon, anchors and moorings are stowed and the vessels return to the ports.
- (e) As regards income distribution, a pool account system is established on an individual vessel basis. For example, in the case of 3 crew per vessel, the balance of total proceeds of landing minus expenses is divided equally by three. In order to control the activities of purse seiners which, chasing after fish schools congregating around man-made reefs, tend to trespass on the banned areas, two vessels are used to guard the fishing ground every night on shift basis. The cost of this surveillance is borne by the Horse Mackerel Angling Management Study Group.

The characteristic feature of the Collective Fishing Operation Scheme is that the whole fleet participating in the fishing operations does not move its fishing position once it is determined. Without the member fishermen's cooperation and understanding, this type of operation could not be possible.

#### 4. Results and Issues

As a result of management by the Collective Fishing Operation Scheme for horse mackerel, the following effects have been observed.

- (a) A basic framework with which to prevent otherwise unnecessary troubles over fishing ground usage has been established. In other words, the scheme has enabled fishing operations in the area to be orderly.
- (b) Competition for better fishing points has become unnecessary and, accordingly, fuel oil consumption per vessel has been reduced.
- (d) The necessity of cooperation has become well recognized by the member fishermen, and led to the establishment of fishing arrangements in cooperative way not only in other types of fisheries by the Mugi Higashi FCA but also in the adjoining FCAs of Mugi city. For example, the three FCAs with which Mugi Higashi FCA shares common fishing rights agreed to establish a "Joint Territorial Resource Divers Association" in 1985. Further, Mugi Higashi FCA and two adjoining FCAs established a "Longline Fishery Management Study Group Liaison Network" in 1983.

Fisheries based on fishing rights as well as licenses have been governed by institutional regulations in some form or other. Accordingly, the management of these fisheries is relatively easier than attempts to control free fisheries which are not governed by an institutional framework.

In spite of the fact that a mechanism of collective fishing has been established at the Mugi Higashi FCA, it has not succeeded in securing steady migration of horse mackerel resource to the artificial reef areas. The horse mackerel, a pelagic species, has not significantly migrated to the reef areas in the Mugi Higashi area, nor indeed to other coastal areas of the Tokushima Prefecture facing the Pacific Ocean. The reason for this is not known. If it has been a result of human interventions (such as by overfishing by using lure bait, etc.), some form of regulatory measures coupled with wider resource management measures would be necessary.

A second problem is that the commander of the horse mackerel fleet has had to carry out his role on a self-sacrificed manner, namely free of charge. Some form of payment to the commander and commander vessel should be made by the Horse Mackerel Angling Management Study Group.

Finally, the pool account system, based on a vessel basis, had better be changed to the fishing operation unit basis. Since one unit comprises 9 fishing vessels having, on average, 3 crew on board each, the total number of crew per unit is approximately 30. Angling is purely manual in its operation and often results in large differences of catch by individuals. Accordingly, it may not be appropriate to apply the pool account system to the entire fleet. However, in the case of fishing operation unit, such differences may be meagre and would enable the crew be treated in an equitable manner.

## MANAGEMENT OF STARDUST SHRIMP FISHERY IN THE SURUGA BAY

by

**Stardust Shrimp Fishery Management Cooperative Association  
Shizuoka Prefecture, Japan**

### ABSTRACT

An important fishery for stardust shrimp (*Sergia lucens*, Hansen) has been carried out for many years by fishermen from coastal villages around Suruga Bay, Japan. After World War II, increased investments in larger and more powerful boats, synthetic nets, echo sounders and other more efficient fishing aids combined to produce a very considerable and uncontrolled increase in the level of exploitation of the resource. Catches declined and costs per unit of effort rose. A stardust shrimp fishery cooperative was therefore set up to control fishing and manage the resource. The Cooperative laid down strict rules regarding the size of the boats, the manner in which fishing should be conducted and a special committee decided daily fishing patterns and daily total allowable catches. Of particular importance to the success of these initiatives was the eventual agreement of a system of joint fishing operations allied with the pooling and sharing of the proceeds from the sale of the catch. These steps have stabilized the market, avoided overcrowding on the very restricted fishing grounds, substantially reduced fishing costs, improved the working conditions of the fishermen and helped to achieve a more rational utilization of the fishery resource.

### 1. Fishing grounds in the Suruga Bay

The Suruga Bay has little continental shelf and the sea drops sharply to a depth of 1,500-2,500 meters in the center. The Bay yields annually 3,000-7,000 tons of stardust shrimp (*Sergia lucens*, Hansen). The shrimp has a body length of 40-50 mm with little swimming capacity. During day, it stays at a depth of 300-400 m and moves upwards to 30-80 m depth at night. Fishing is thus done at night to catch the school when it is nearer to the surface. The life span is a year and a half with the spawning period of June to September. It grows to 20-30 mm during the autumn fishing season (October to December). The spring fishing season lasts from March to June. Some shrimp are caught during the next autumn season and even in the subsequent spring season. The main fishing grounds are in 200 m depth line as shown in Appendix 1.

The autumn fishing is off the coast of Yaezu and the mouth of Ohi River while the spring season concentrates off the mouth of Fuji River.

Since the good fishing grounds are rather limited, too much fishing effort used to be exerted over the resource leading to over-exploitation. This concern for overfishing led to the introduction of a management scheme for this valuable resource (annual sales amount to

US\$ 15 million). Moreover, it is only in this Bay that this resource exists in sufficiently large quantity to be harvested economically, making it a speciality for the region.

## **2. Fishing Villages Engaged in Stardust Shrimp Fishing**

The fishing villages along the Bay are engaged in set net, line fishing, longline fishing, and gillnetting like in any other coastal village in Japan, but trawling for stardust shrimps is the most economically important fishery. In 1984, the total value of shrimp catch amounted to US\$ 16 million. The shrimp catch accounted for 87% of the total catch by the coastal fishing villages of the Yui Fisheries Cooperative. In the case of the Ohi River Fisheries Cooperative, the shrimp catch fetched US\$ 6.6 million accounting for 80% of the total catch.

The number of licensed shrimp pair trawlers is 120 (60 pairs) in total for the Bay of which Kambara district has 37, Yui 49 and Ohi river 34.

The Kambara and Yui districts are engaged almost exclusively in pair trawling for shrimp and whitebait while the Ohi river district conducts all types of coastal fishing.

According to the 1983 census, the number of fishermen had decreased over a 10 year period from 160 to 148 in the Kambara district, 424 to 346 in the Yui district and 235 to 193 in the Ohi river district. In total, this represented a 16% decrease in the number of fishermen over 10 years. The average age of the fishermen also increased over the same period from 45 to 55.

Despite the decrease in the number of fishermen and their aging, so far there is no indication that these factors affect the catch. This is due to the introduction of labour saving devices such as the net roller and to the adoption of a collective management system which has eliminated overfishing.

## **3. History of Stardust Shrimp Fishery**

In 1895, some fishermen trawling for horse mackerel at night caught a large school of shrimp incidentally. At that time the fishing boats had no power except sails and paddles. Mechanized boats were introduced only around the 1930s with the same fishing method.

After the World War II, mechanization commenced in earnest. The fishery was officially called "small-scale purse seining" and the size of the boat increased to 5 GT with a 30 or more HP diesel engine. Synthetic nets were introduced in 1958, netrollers in 1959, echo sounders in 1960 and transceivers in 1965. As a result, the fishing capacity substantially increased.

In the beginning of 1971 FRP boats were introduced with wide opening trawl nets and net zonde. "Small-scale purse seining" was converted to "stardust shrimp pair trawling". The maximum size of the vessels increased to 7 GT with 100 HP engine and 10 knots speed. They are crewed by 16 to 18 men for a pair trawling. However, the increased fishing efficiency did not result in increased catch as can be seen in Appendix 2.

As can also be seen from Appendix 2, the greatest catches were obtained in the early 1900s. After World War II the same level was obtained in late 1960s. Therefore, increased investment in larger boats and more efficient gear seemed to have contributed to a declining catch resulting in increased cost per fishing effort. Due to the limited resource and fishing ground this tendency became very pronounced.

The number of licensed pair trawlers has decreased from a maximum of 178 in 1917 to the current level of 60 pairs. However, the increased fishing effort has more than offset the declining number of fishing units. This overfishing trend, coupled with the fact at present only the 3 districts are engaged in this shrimp fishery, paved the way for the introduction of a management regime with pooling of costs and profits.

#### **4. Management of the Resource**

The fact that both the shrimp resource and the fishing grounds are limited and the catch realizes a huge profit led inevitably to uncontrolled overfishing. The need for the shrimp boats to install a net exclusion device over its propeller to avoid entanglement with the net of other boats indicates the fierce, crowded fishing conditions that existed.

In order to avoid overfishing, a Stardust Shrimp Fishery Cooperative was set up in the Shizuoka Prefecture composed of all boat owners engaged in this shrimp fishery in the Prefecture. Its rules stipulate how fishing should be conducted to avoid collision and entanglement of net, etc. It also limits the size of boats to 5 GT or less with maximum HP at 40. No construction, conversion or improvement of boat is permitted without the cooperative's agreement. When the above is approved, it will be subject to inspection by the cooperative at any time.

The cooperative has a fishing committee composed of ship owners and captains selected from the cooperative members every three years. During the fishing season, the committee decides daily: (1) whether to fish that day (2) when, where and how long to fish, and (3) the total catch of the day. The committee has the ultimate responsibility for fishing activities and related decisions are final and even the cooperative chairman cannot challenge. It literally commands the operation of the fleet of 120 boats (60 fishing units) from the 3 districts.

#### **5. Introduction of a "Pooling" System Coupled with Control Over Fishing Effort**

A key to the successful management of the fishery was the introduction of a "pool" accounting system for the sales from catch.

In 1966, some of the ship owners of the Yui district tried the idea of pooling the sales from the catch of their boats and distributing it equally among them combined with a joint fishing operation. The experience demonstrated the merit of a system of joint fishing and accounting which enabled some of the boats to scout for schools of fish while others were engaged in fishing on a full-time basis. This resulted in more efficient fishing operation and the prevention of overfishing.

In 1966, the 3 districts separately introduced a limit upon fishing time to reduce fishing effort. In 1968, the districts also introduced a pooling system on a district basis but without great success. It led to protests by some fishermen who had higher fishing efficiency than others that the proposed equal distribution of the sales was unfair to them.

Eventually, the pooling system was restored when the fishermen realized that without it the shrimp market collapsed. For the next 9 years, until 1976, these pooling systems were implemented on a district basis. Over this period, there were several events that required joint efforts by all fishermen of the 3 districts, in particular industrial pollution of the coastal waters and financial crisis caused by declining catches.

Finally in 1977, a pooling system covering all 3 districts was established. Combined with fishing effort control, the fishery now has a management system covering the entire Bay.

Furthermore, in 1983, the cooperative's sales commission was charged to the pool account thus eliminating competition among the cooperatives for sales and permitting the disposal of the catch at best market prices in the 3 districts.

## **6. Calculation of the "Pool"**

- (1) First net profit is obtained by deducting various costs from the total sale value of the catch. These costs consist of the association's handling charge (3%), fuel and oil costs, ice costs and costs of depreciation and maintenance of echo sounders.
- (2) The resulting net profit is divided 60% for the crew and 40% for the owners.
- (3) The individual fisherman's share is calculated by dividing the above 60% by the members of the crew plus 20% bonus for the engineer plus one roller share (equivalent to one crew per fishing unit).
- (4) The ship owner's share is obtained by deducting 20% bonus for the captains from the 40% share and then dividing by the number of owners (60 fishing units).

The distribution system for the crew thus is very equitable except for the 20% bonus for the captains and engineers and the fishermen are rewarded irrespective of their age, experience or physical strength. Appendix 3 shows an example of the distribution actually made in 1983.

## **7. Effects of the Management System**

The reason for the introduction of the "pool" system was said to be for stabilization of the market. But if this is the only reason, there are other ways of accomplishing it such as catch limitation or catch quota for individual fishing boats. The most important result seems to be the replacement of competition among the ship owners with a collective desire for a joint financial success of the fishery as a whole. The beneficial effects are summarized below.



- (1) By adjusting daily the catch and landings according to market conditions, it has been possible to avoid large fluctuations in landed prices. The fishery does not, however, enjoy a monopoly since it faces competition from imported small shrimps from Taiwan, Malaysia and Philippines. Therefore, its cost/supply elasticity is less than 1.0 (according to the actual data from 1966 to 1984, it was ' 0.8). In any event, under this system, a large catch should not cause the market to collapse.
- (2) Rational deployment of fishing boats prevented overcrowding on the good fishing grounds and use of some boats for other than fishing such as scouting for schools.
- (3) These efforts have resulted in a substantial reduction in fishing costs for the same level of catch.
- (4) In contrast with free-for-all competition, regulated fishing days and hours have led to better working conditions for the crew.
- (5) A more rational utilization of the resource has been achieved. The catch limitations should contribute towards sustainability of the resource. It should, however, be based on more scientific assessment of the resource.

The factors behind the success of the management system are considered to be the following: (1) the fishing is confined to a well defined area - a single Bay; (2) the fishing season and grounds are limited thus liable to overfishing if left free; (3) the fishing is targeted to one specie only; (4) the cooperative realized the danger of overfishing; (5) only 3 districts were engaged in the fishery making a collective action easier; (6) un-coordinated campaigns against coastal pollution convinced the fishermen of the importance of collective action; (7) the ship owners' financial status were more or less equal; (8) the cooperative had an excellent leader.

## 9. Future, Issues

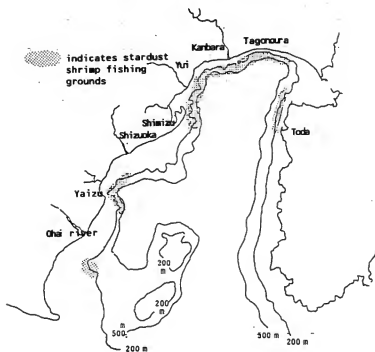
Though the system is working satisfactorily, to improve it some issues will have to be resolved.

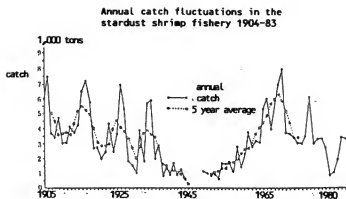
- (1) There seems to be a trend towards overinvestment in terms of improved fishing boats with the maximum HP. This is because a ship owner gets an equal share of the sale of catch even though his boat is old and less efficient. He felt then obliged to upgrade his boat to avoid potential criticism. This trend is verified by the fact the average HP had almost doubled from 1973 to 1983. The trend must be reversed to reduce fishing costs. Increased HP will not lead to an increased catch and is, therefore, quite unnecessary.
- (2) There are some conflicts of interest among the 3 districts as well as the ship owners. The pool system, therefore, must evolve to forestall such conflicts.
- (3) The shrimp fishing seasons last only 60 days in total. Some ship owners, therefore, also use the boats for white bait fishing during the off season. This fishery is

becoming important to supplement their income from shrimp fishery. In future, therefore, the management system should be extended to include this fishery.

- (4) The cooperative sells the catch to processors. In order to expand the market, the two must work together closer. The processors' views should be taken into account in determining the catch size and fishing days.
- (5) More scientific assessment and monitoring of the resource is needed so that control of fishing effort can be carried out on more scientific basis.

Map 1. Stardust fishing grounds  
in Suruga Bay





Source: Catch statistics of stardust shrimp  
in Suruga bay, S. Ohwori and M. Makita  
1976, 1983.

An example of "Pool account" for  
12 May 1983

I. Net profit	Yen
(1) total sales	70,713,077
- coop commission, 3%	2,121,391
- fuel & oil	720,000
- echo-sounder	2,828,780
- ice	106,600
(2) Balance A	64,936,306
II. Crew's share	
(1) total share (A $\times$ 60%)	38,961,784
- number of crew (persons)	938
- bonus for engineers 120 men $\times$ 20% (persons)	24
- roller share (60 fishing units)(persons)	60
(2) total (persons)	1,022
(3) individual share (1) $\div$ (2) B	38,125
III. Ship-owner's share	
(1) total ship-owners share (A $\times$ 40%)	25,974,522
(2) bonus for captain (120 men $\times$ 20% $\times$ B)	915,000
(3) share for individual owners ((1)-(2)) $\div$ 60 men	417,625
IV. Adjustment	56

## RESOURCES MANAGEMENT THROUGH PROPAGATION AND RE STOCKING PROGRAMMES

by

Iwami Fishermen's Cooperative Association, Hyogo Prefecture,  
Japan

### ABSTRACT

Faced with a depletion in the resources and declining catches, the small Iwami FCA in the Hyogo Prefecture planned and implemented a substantial intermediate culture and restocking programme for Kuruma prawn and other valuable species. Assisted financially by prefectural and local governments and technically by the regional fish farming research centre, the Cooperative's special study group cultivated post-larvae prawns and then restocked them into tidal lands designated as nursery areas. Tagging experiments were undertaken to study the behaviour of the stocked species. Restrictions were placed on the type and extent of fishing in the nursery areas. Similar initiatives were taken in respect of halibut and blue crab. These propagation and restocking operations have already led to increased catches and other evidence of recovery in the resources. They have also created a recognition among the local fishermen of the importance of fisheries management and the need for compliance with agreed rules and regulations to this end. Further steps are, however, still required to strengthen other management regulations not yet formalized and to study additional means of ensuring the more rational use of the fishing grounds and a more equitable distribution of the proceeds from the catches.

### 1. Introduction

Iwami Fishermen's Cooperative Association is located in Mitsu town, Ibo County, the southwestern part of Hyogo Prefecture, facing the Seto Inland Sea. It is on the western end of the Harima Coastal Industrial Zone whose centre is Himeji City.

The total population of Mitsu town was about 20,000 with 2,212 households in 1955. However, this increased to about 12,500 with 3,084 households by 1980. This is because Mitsu town is within commuting distance from Himeji City and many workers in the Industrial Zone had moved to reside in the town. In 1960 there were 612 people in the primary industry of Mitsu town, comprising 268 fishermen and 344 agricultural farmers. In terms of value of production, fishermen produced nearly twice as much as agricultural farmers.

### 2. The Fisheries of the Region

There are three fishermen's cooperatives in Mitsu town: Kariya in the east, Iwami in the middle and Murotsu (the largest) in the west.

As of May 1984 there were 205 members in Iwami Fishermen's Cooperative comprising 64 regular and 117 associate members engaged in small trawl, set net and nori (laver) culture. The qualification required for regular members is for him/her to engage in fisheries more than 90 days a year. There are 52 regular member households in the Cooperative. The total number of fishing vessels owned and operated by member fishermen of Iwami FC has shown little change in recent years. In 1983 there were 81 vessels: 70% (57 vessels) of the total were less than 3 gross ton in size and the rest between 3 and 5 GT. Iwami FC has fishing rights jointly with the Murotsu and Kariya FCs and also aquaculture rights for nori culture.

By using the fishing rights and prefectural governor's licences, the member fishermen of Iwami FC are engaged in 25 small trawl, 18 shellfish collecting, 15 boat seine, 15 nori culture and 14 small set net fisheries. The total value of fisheries production of Iwami FC in 1983 was 180 million Yen. Of this, small trawl accounted for 44.2%, followed by 23.7% for nori culture, 13.9% small set net, 11.8% boat seine and 5% from shellfish collecting. Average income of the members was low at 3.4 million Yen. In terms of quantity, the total production has been about 350 tons from 1977 to 1980, increasing to 400 to 700 ton levels after 1981 when production of sand lance by boat seine was started.

Iwami FC has advantages in terms of marketing members catches because of its geographical proximity to big consumption centres such as Osaka and Kobe. Except for nori (laver), all the species landed at Iwami port are marketed by auction and shipped to such big cities markets either as live or fresh fish, often fetching high average prices of over 800 Yen/Kg.

### **3. Incentives for starting Intermediate Culture and Stocking of Kuruma Prawn and other species**

The fishing grounds in the Seto Inland Sea adjacent to the Iwami Fishermen's Cooperative was rich in resources. However, the successive development of industrial complexes along the coast of Harimanada area of Seto Inland Sea led to a depletion of resources. For example, small trawl catches decreased from 158 t in 1977 to 116 t in 1980. Seeing such a downward trend in production by the small trawl fishery, the members of Iwami FC, 85% of them being full-time fishermen depending for their livelihood on coastal fisheries, had come to feel strongly that something must be done to stop the depletion of resources. This sense of crisis on the part of the fishermen concerning the level of resources constituted the prime factor which prompted them to take action towards resource conservation and propagation.

The seas adjacent to Iwami FC had seaweed bed areas and fishing grounds of tidal land, rarely found in Hyogo Prefecture. Such seaweed and tidal land areas constituted nursery grounds for Kuruma prawn (*Penaeus japonicus*), blue crab (*Portunus* sp.) and short-necked clam (*Luditapes* sp.). It was therefore decided in 1980 by the members of "Iwami Gyokyo Yusuikai (IGY)" (Fisheries Study Group of Iwami Fishermen's Cooperative) to undertake intermediate culture and stocking of kuruma prawn, etc., on a large scale.

IGY had been established in 1954 and had primarily studied improvements of fishing gear, aquaculture technology of nori (*Porphyra* sp.) and management of fisheries. After 1974, IGY started preliminary work on resource propagation programmes. The present number of members of IGY is 23 comprising 18 small trawl fishermen (of which 7 are also engaged in nori culture in winter season), 2 small set net fishermen and 3 employees of Iwami Fishermen's Cooperative.

Major resource propagation programmes of IGY which have been implemented so far are as follows:

Species	Intermediate Culture	Stocking of fry into sea
* Kuruma prawn ( <i>Penaeus japonicus</i> )	From 1971 to date	From 1971 to date
* Bastard halibut ( <i>Paralichthys olivaceus</i> )	From 1981 to date	From 1981 to date
* Blue crab ( <i>Portunus trituberculatus</i> )	From 1983 to date	From 1978 to date
* Rockfish ( <i>Hexagrammos otakii</i> )		1978-1982
* Short-necked clam ( <i>Luditapes philippinarum</i> )		1978-1981
* Scallop ( <i>Pecten albicans</i> )		1982

In addition to these species, IGY has studied and practised stocking of other species such as hard clam (*Meretrix lusoria*), snail (*Babylonia japonica*) and ark shell (*Scapharca broughtonii*) on a small scale.

The expenses necessary for these propagation efforts, amounting to about 4.7 million Yen in 1983, were covered by subsidies from the prefecture, town and concerned private organizations and by fishing fees collected from member fishermen.

(1) Intermediate culture and stocking of Kuruma prawn

IGY had implemented intermediate culture and stocking of Kuruma prawn of about 800,000 fry since 1971. However, it was not until 1980 that such efforts began to be done in large scale. For example, in 1983, 1.5 million post larvae Kuruma prawn of 1.2 cm in size were put into intermediate culture facilities for 12 days from July 18 to 29. One million individuals, or 67%, survived during this period and were stocked into the sea. The size at the time of stocking was 3 cm.



Further, 0.4 million post larvae Kuruma prawn of 4.0 cm were obtained and directly stocked into the sea, making the total stocking of Kuruma prawn 1.4 million in number. These post larvae were obtained free of charge from the prefectural fisheries experimental station and farming centre.

In 1980, the Iwami Fishermen's Cooperative, promoted by the members of IGY, established a "Rule of Management of Nursery Grounds common to Iwami, Murotsu and Kariya FCs" (see Fig. 1). For this purpose, 1,200 ha of tidal land area adjacent to Iwami FC was designated as a special nursery area where necessary facilities for intermediate culture were developed, improved nursery and stocking methods tested and tagging and marking experiments to study behaviour of stocked species undertaken. This rule was in force over the period from April 1, 1980 to March 31, 1984.

Major provisions of this rule included:

- a) Prohibition of Kuruma prawn fishing inside the nursery ground by fishing gears other than small set net with less than 2.16 cm mesh size bag.
- b) Prohibition of catching Kuruma prawn of less than 10 cm in total length;
- c) Nomination of nursery ground patrol members from among the member fishermen and providing them with power to ensure compliance with the provisions of the rule;
- d) Penal provisions.

For the purpose of intermediate culture of Kuruma prawn, two land-sited tanks of 10m (L) x 5m (W) x 1m (D) each were established by improving the nori seed collection facilities.

Technical improvements were made in stocking after intermediate culture: stocking was related to the intermediate culture tank water, which helped prevent damaging the prawns. As a result of studies of Kuruma prawn behaviour after stocking, it was found that the 3 cm prawn at the time of stocking grew to 4.5 cm within one month inside the nursery zone.

Result of Intermediate Culture and Stocking by Fisheries Study Group of Iwami Fishermen's Cooperative in 1983

Species	Number of fry/larvae used for intermediate culture (A)	Duration of intermediate culture		Growth Cm.	Number of fry larvae stocked (B)	Yield = (B/A) x 100 %
		Months	Days			
Kuruma prawn	1,500,000	July	12	1.2 - 3.0	1,000,000	67
	400,000	Aug.	-		400,000	100
Bastard halibut	50,000	May-June	25	1.2 - 3.0	45,000	90
	40,000	June	-	2.2	40,000	100
	15,000	July	-	4.0	15,000	100
Blue crab	200,000	Jun-Jul	20	0.3 - 2.5	20,000	10

(2) Intermediate culture and stocking of Bastard Halibut

Intermediate culture and stocking of bastard halibut (*Paralichthys olivaceus*) has also been carried out using the two on-land tanks. After stocking the fish into the sea, tagging and marking studies have been made. IGY members have continued to study migration routes and wintering areas of bastard halibut and to determine the most appropriate stocking points from stomach contents analysis.

(3) Intermediate culture and stocking of blue crab

In intermediate culture of blue crab, old nori culture net was hung in a zigzag form in the tank to prevent cannibalism. Other technical improvements were made to culture baby blue crab in the intermediate culture tank. However, the survival rate was low at 10%. In order to study ecological behaviour of blue crab, various after stocking surveys were conducted.

4. Effects of these efforts

One of the effects of these intermediate culture and stocking efforts is that there has been every sign of resource recovery as represented by increased catches (see Fig. 2). Because of increased catches from the small trawl fishery, which aims at catching Kuruma prawn and bastard halibut, etc., the state of this fishery has gradually become stable. Another effect is that the importance of fisheries management has come to be widely recognized among the fishermen in the region.

This awareness of the need for resource conservation has encouraged fishermen to voluntarily participate in the various cooperative's resource enhancement efforts agreed upon by the members. Examples include:

- a) Compliance with the Nursery Ground Rule;
- b) Cooperation in releasing small size Kuruma prawn of less than 10 cm in total length found in the catch;
- c) Releasing of bastard halibut of less than 20 cm in size and 100 g in weight that are caught by small set net in August to September;
- d) Cooperation in releasing small size blue crab of less than 12 cm in size found in the catch (after 1983).

As regards short-necked clam, stocking has been suspended since 1981. However, the Iwami FC established its own voluntary "Short-Necked Clam Fishing Rule" in February 1984 to supplement the Rule on the Use of Common Fishing Right with a view to conserve the resource and maintain favourable joint marketing prices. The rule includes such measures as size limit (requirement to release short-necked clams of less than 2.5 cm in size), prohibition of use of pump gear for fishing from April 1, 1984, time of fishing operations, size of fishing gear, area of operations, taking of 5% out of the sales of the catch for purchase of seed, etc.

## 5. Future Issues

It will take further time and effort before proper fishing ground management schemes including rational use of the grounds and equitable distribution of catch, are realized. There are several problems which still require solutions.

First, the "Rule on Management of Nursery Grounds Common to the Iwami, Murotsu and Kariya FCs" expired at the end of March 1984 and has not been renewed. One of the reasons is said to be that gill net fishermen in the region have not been satisfied with the Rule which prohibits fishing of small size Kuruma prawn of less than 10 cm in total length. Even if small in size, Kuruma prawn can be sold at relatively good prices. Therefore, there are some gill net fishermen who do not release small size Kuruma prawn. However, from the standpoint of resource conservation, the rule must be complied with. Thus, the securing of all the fishermen's consensus concerning resource conservation measures remains a problem within the Iwami F.C.

Secondly, the abstention measures to conserve bastard halibut and blue crab resources have not yet been promulgated as formal rules. There are no penal provisions. The conservation measures are thus unlikely to be complied with by all the fishermen concerned. Accordingly, it is necessary to formalise the rules in a written form like those for Kuruma prawn. In particular, it is important that the three fishermen's cooperatives (Iwami, Murotsu and Kariya) establish common rules to enhance the resources since these three cooperatives share the same Common Fishing Right area. Comprehensive fisheries management plans need to be established including best use of nursery grounds and abstention measures so as to secure stable development of fisheries. Moreover, cooperation not only of fishermen's cooperatives and their federations but also competent government authorities, etc., must also be secured.

Fig. 1

Prawn Nursery Ground Managed  
by Iwami, Murotsu and Kariya Fishery  
Cooperative Associations, Hyogo Prefecture

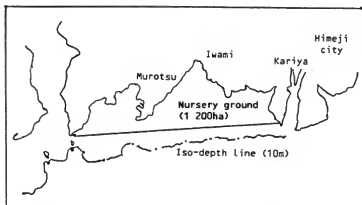
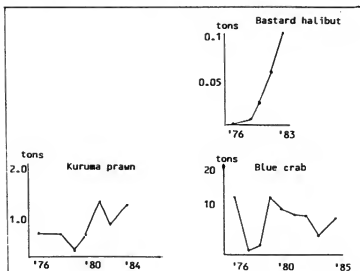


Fig. 2

Changes in Annual Catches of Kuruma Prawn, Bastard  
Halibut and Blue Crab in Iwami Fisheries Cooperative Assoc.



## A POOL ACCOUNT SYSTEM IN LOBSTER MANAGEMENT

by

Katsuura Fishermen's Cooperative Association, Wakayama Prefecture,  
Japan

### ABSTRACT

The paper describes the steps taken by the Katsuura FCA in the Wakayama Prefecture to regulate a valuable fishery for lobster by means of entry restrictions allied with a profit-sharing pool accounting system. The Katsuura lobster fisheries are concentrated around Yamanan island in a fishing season of only 10-20 days at the conclusion of which a very high percentage of the available resources have been caught; CPUE declines rapidly each succeeding day over the very short season. The replacement of the traditional cotton gill nets by synthetic filament nets, coupled with motorization, led to a sharp increase in fishing effort, creating overcrowding, conflicts and accidents on the grounds and threatening the sustainability of the resource. In 1959, therefore, the Cooperative reinforced existing management measures and, in particular, introduced strict controls over qualifications for access to the lobster fishing grounds which were categorised in terms of their abundance; access to the best grounds was confined to the fishermen with the longest membership/experience. An equal profit, pool account system was also introduced, partly to ensure orderly fishing and avoidance of conflicts/accidents. Combined with a programme of restocking the grounds with undersize lobsters incidentally caught, the limited entry/pool account system has proven to be a successful management tool; the main problems encountered are those arising from the need to limit entry to a fishery so profitable that all wish to participate in it.

1. Katsuura Fishermen's Cooperative Association is located in Katsuura City (see Fig. 1), a famous base port for nearshore tuna fisheries in the Wakayama Prefecture which faces the Pacific Ocean. Coastal fisheries are also prosperous in Katsuura, particularly those for lobster.

### 2. Management of Lobster Fishing

The best lobster fishing ground in Katsuura is located around Yamanari island off Sotonoyu, a small peninsula. Lobsters are also widely distributed in the coastal sea areas adjacent to Sononoyu but not in such abundance as in Yamanari. The lobsters inhabit rocky bottom areas and their abundance differs considerably from area to area (see Fig. 2).

Lobster fishing is open from September 10 to April 30 in the Wakayama Prefecture. In practice, however, the fishing season is concentrated over 10 to 20 days during November to December because lobster fishing is mostly a part time job and other types of fisheries are operated in other months of the year.

Lobsters do not migrate: they are resident species in mostly the same habitat all their life. Thus, CPUE decreases as cumulative catch increases (Fig. 3). Further lobster resources can easily be heavily exploited; as seen in Table 1, out of the lobster resources available in Yamanari island area of Katsuura FCA, 72 to 98% have been caught a year.

Table 1: Lobster Stock Level vs Catch in Yamanari Island area during 1974 through 1979

	Stock level before opening of fishing A	Catch B	Catch Rate = (B/A) x 100%	Balance = A-B	Recruit- ment
1974	1,800 Kg	1,304 Kg	0.72	496 Kg	- Kg
1975	2,000 Kg	1,842 Kg	0.92	158 Kg	1,504 Kg
1976	2,600 Kg	1,949 Kg	0.74	651 Kg	2,442 Kg
1977	1,600 Kg	1,088 Kg	0.68	512 Kg	948 Kg
1978	2,200 Kg	1,730 Kg	0.78	470 Kg	830 Kg
1979	1,300 Kg	1,274 Kg	0.98	26 Kg	- Kg

Source: Hiroyoshi Kanamori and Seiji Kanamaru Studies on Lobster Ecology and Resource in the waters around Kumano, Wakayama Pref. Fish. Experimental Station

These circumstances have encouraged the lobster fishermen in the area to employ such management methods as closed season, closed area, designation of conservation area, minimum size limit in total length, number of gill net to be used, etc. These measures have sometimes been more strict than those set by the prefectural government.

In Katsuura FCA, those lobsters which are smaller in size than the minimum size controlled by the prefectural government are purchased from member fishermen, stocked into intermediate stocking tanks and, after restoring their strength, released to specific areas where lobster fishing is banned by the cooperative. This restocking programme has been operated by the cooperative since 1976.

### 3. Lobster Management Measures by the Katsuura FCA

#### (1) Limited Entry

In the years from the later 1940s to the 1950s, the catch of lobster had continued to decrease. Excess fishing effort was apparently the cause of this decrease. In December 1959 the Katsuura Lobster Gillnetters Association (KLGA), a group of lobster fishermen established within the Katsuura FCA, agreed to restrict access to the Yamanari island area, the best fishing ground, to those members who had been admitted to the Association and engaged in lobster fishing for more than two years. It was further agreed that if the member

had not carried out lobster fishing for more than three years before the opening of Yamanari island area, he would lose his membership qualification in KLGA.

The lobster fishing grounds at Katsuura comprise three areas: fair, good and excellent. These correspond to the following in Fig. 2.

<u>Fair</u> fishing ground	:	I, IV
<u>Good</u> fishing ground	:	II, III, IV
<u>Excellent</u> fishing ground	:	V (= Yamanari island area)

In 1975, in order to help maintain stable management of the resource, the KLGA established rules providing for further restrictions on the activities of lobster fishermen. Namely, for the first three years after being admitted as member of KLGA, the fisherman must fish in no other places than the "Fair fishing ground". However, if it was a father and son operation, they could fish in the "Good fishing ground". Additionally, the number of gill net used must be less than 5 Tan\*. (\*One Tan of gill net is 80 m in length). From the fifth to the seventh year, the member was allowed to fish in the "Good fishing ground" with 7 Tan of gill net. From the eighth year, he could fish in the "Excellent fishing ground" with 7 Tan of gill net. A pool account system has been adopted in this "Excellent fishing ground", or Yamanari island area since 1960. A newcomer in the "Excellent fishing ground" was therefore required to wait a further four years until he became fully qualified to receive 100% of his share.

In 1984 these conditions were relaxed. For the first six years after being admitted as member, the fisherman is allowed to operate anywhere except for the "Excellent fishing ground" (= Yamanari island area). From the seventh year, he is allowed to operate in the "Excellent fishing ground" and is entitled to receive 100% of his share in the pool account immediately.

One of the major reasons why stricter controls over the lobster fishing became necessary after the 1950s was because synthetic nets began to be marketed and easily purchased. Previously nets had been made by fishermen themselves and, therefore, it was not easy for other fishermen to start lobster fishing. The availability of synthetic nets helped to increase the number of those fishermen who relied for their livelihood on pension + lobster fishing + small coastal fisheries. They were, in fact, mostly retired crew members of skipjack and tuna vessels.

## (2) The Pool Account System

In 1959, the KLGA also introduced a pool account system, an equal profit sharing arrangement. The system also provides that, if a net is lost because of an accident during fishing operations, that loss shall be covered by the expenses of KLGA.

Fig. 4 shows the positions of lobster gill nets and catch in Yamanari island area on 24 November 1981. The dotted line indicates the gill net position on the sea bottom and the figures show catch per vessel in Kg. Clearly, catches differ from one place to another: where to set the net determines the outcome. If use of the fishing ground in the Yamanari island area was left to free competition, there would clearly be conflicts over the best places

to set the nets. The fishing ground in Yamanari area is small and fishing vessels are relatively large in number. Thus, unless the fishing is orderly, the nets might get entangled. Because of these reasons, arrangements for use of lobster fishing ground become necessary, either through a lottery or a rotation system.

In lobster fishing, however, both lottery and rotation systems are not very feasible because catches decrease as time progresses (see Table 2). The example in Table 2 shows that CPUE decreased to less than one tenth within six days after opening of the fishing. It is thus impossible to distribute the fishing ground equally among the participating vessels. Even the best spot may result in different quantity of catches depending upon on which day it is fished. The pool account system, however, enables each fisherman to receive an equitable share of the proceeds of the overall fishing operation.

Table 2: Result of Lobster Fishing Operations in Yamanari Island area from the day of opening until the 6th day in 1979

	1st day	2nd day	3rd day	4th day	5th day	6th day
Total No. of Gill Net Tan used	274	280	280	280	275	255
Catch in KG	567	330	143	101	84	47
CPUE in KG/Tan	2.1	1.2	0.5	0.4	0.3	0.2
Cumulative catch in Kg	-	567	890	1,042	1,143	1,227

In the case of lobster fishing on pool account system in Yamanari island area in 1979, fishing was opened for only six days. After this, the "Good fishing ground" was opened and fished for four to five days. At this stage, the abundance of lobster resources became equally low irrespective of the fishing ground spots/areas. The fishing ground is then fished on an individual basis. Young fishermen shifted to other fisheries and only the elderly continued to fish lobsters. As long as KLGA continues to make efforts to increase lobster stocks by re-releasing small size lobsters and females, equal opportunity of use of fishing ground must be secured. Further, profit sharing factors have to be considered.

The pool account system was introduced in the "Excellent fishing ground" (Yamanari area) from 1960 and extended to the "Good fishing grounds" in 1978. An additional incentive for adopting the pool account system in the latter area was an accident to one lobster fishing vessel in 1977 in which one fisherman became missing. This accident arose as a result of excessive competition for specific fishing spots. Several days were spent for search and rescue of their missing friend. As lobster fishing is done only for 10 to 20 days a year, the economic loss of the several days was quite large. This accident became a strong incentive to adopt the pool account system even in the second rate fishing grounds in order to secure orderly and safe fishing operations. In the case of a lottery or rotation, those who win the best spot or get a good turn would try to go fishing even if it was bad weather because clearly he must fish in less attractive spots the next day. Here is a potential cause of accidents.



There are three types of fishermen engaged in lobster fishing:

The first are those who participate in lobster fishing during the pool account period on the excellent and good grounds and after it is over continue to fishing the "Fair" fishing ground as well as in the others. A relatively large number of elderly fishermen belong to this category as lobster fishing can be done without great physical effort compared to other types of fisheries.

The second type are those who only take part in lobster fishing during the pool account period. They operate in other types of fisheries such as the stick-held dip net fishery for Pacific saury after the period is over. Relatively young fishermen predominate in this type. They are primarily engaged in stick-held dip net, trolling, angling and longline fisheries and, accordingly, lobster fishing is a part time job for them.

The third type are those who do not join the pool account system in lobster fishing: they engage in lobster fishing on the "Fair fishing ground" part of their time, but mostly in other types of fisheries.

Table 3 gives yearly trend of number of fishermen who took part in the pool account system in Katsuura Lobster Gillnetters Association by fishing area and profit share received per fisherman during the years from 1961 to 1984.

Table 3

Year	No. of fishing days		No. of fishermen		No. of fishing vessels		Catch in Kg		Profit share received per fisherman from the pool account in Yen	
	Fishing ground		Fishing ground		Fishing ground		Fishing ground		Fishing ground	
	①	②	①	②	①	②	①	②	①	②
1961	7	-	-	-	20	-	-	-	16,987	-
1962	-	-	-	-	-	-	-	-	-	-
1963	6	-	-	-	27	-	-	-	41,600	-
1964	-	-	-	-	-	-	-	-	-	-
1965	9	-	43	-	15	-	-	-	37,840	-
1966	8	-	67	-	-	-	-	-	-	-
1967	4	-	50	-	17	-	-	-	19,200	-
1968	-	-	59	-	16	-	1,822	-	49,040	-
1969	-	-	63	-	16	-	-	-	30,761	-
1970	10	-	80	-	20	-	-	-	68,280	-
1971	9	-	66	-	17	-	2,110	-	101,400	-
1972	11	-	81	-	19	-	2,280	-	85,470	-
1973	11	-	77	-	18	-	1,700	-	93,400	-
1974	8	-	-	-	20	-	1,313	-	56,130	-
1975	8	-	88	-	-	-	1,830	-	103,300	-
1976	9	-	81	-	-	-	1,918	-	151,100	-
1977	9	-	74	-	-	-	1,069	-	100,034	-
1978	7	-	-	86	-	30	1,769	706	125,000	47,600
1979	7	8	-	79	-	27	1,356	961	135,600	77,000
1980	-	5	-	-	-	-	507	-	63,100	48,150
1981	6	5	-	67	-	-	708	870	88,200	115,500
1982	7	10	-	-	-	-	1,302	1,457	128,800	148,000
1983	5	10	-	-	-	-	1,233	1,118	153,400	78,400
1984	7	7	-	-	-	-	1,381	781	182,000	98,000

Note: ① ~ Excellent fishing ground around "Yamanari island area" corresponding to fishing ground V in Fig. 2.

② ~ Good fishing ground corresponding to fishing grounds II, III, IV in Fig. 2.

- ~ This sign means the data were not available.

Source: Katsuura Lobster Gillnetters Association

#### 4. Discussion

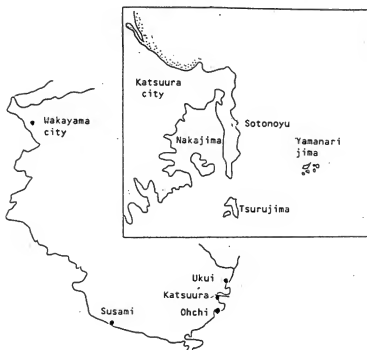
The fishing gear for lobster fishing is mainly bottom gill net. Formerly, cotton gill nets were used and usually made by the fishermen themselves. It was liable to be easily broken, particularly when lobsters were removed from the net. Further, it took time to repair it. As synthetic netting appeared, these obstacles became past history and the quantity of gill net used for lobster fishing, coupled with the introduction of motorized small fishing vessels, sharply increased. Thanks to this technical development, it became possible even for elderly fishermen to engage in lobster fishing without great difficulties.

Moreover, the living "house" of lobsters is a fixed location. If a lobster is caught, another lobster comes and lives in the "house". Thus, under free competition system, those fishermen who come and set the net first in the best fishing ground win. This accelerates competition among fishermen and can lead to accidents and conflicts. Further, once a lobster fishery is opened, CPUE decreases day by day and often to less than one tenth of the first day within one week or so. Usually, the lobster fishing season does not exceed two weeks. All these factors continue to emphasize that unless proper fisheries management measures are taken, problems of resource depletion and fishing operations difficulties will certainly arise.

Under the circumstances, the pool account system has been adopted as the best management method in Katsuura. Allocating good fishing grounds by lottery or by rotation system cannot solve the questions of equal opportunity. Lobsters are often caught well on days of rough weather. This fact only aggravates a situation in which accidents may happen. Adopting pool account system was a practical and realistic choice by the fishermen in the area.

The main problem with a pool account system is that of qualifications of fishermen to join this system and of limited entry. It is quite natural that when the lobster resource management succeeds and incomes per fisherman increase under the pool account system, everybody will wish to participate in the system.

**Fig. 1. Location of Fisheries Cooperatives  
which are operating Lobster Fishing in  
Wakayama Prefecture**



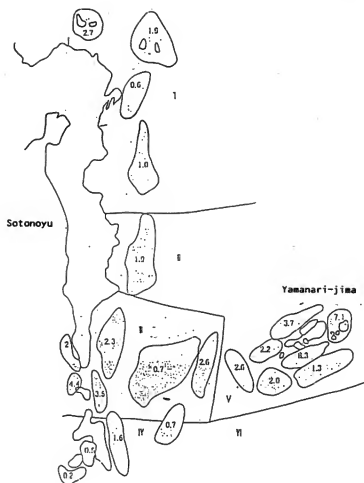


Fig. 2 CPUE as measured by number of lobster caught by bottom gill net per Tan' off Katsuura, Wakayama prefecture during October to November, 1978

Note : Tan ~ Tan is a unit size of gillnet, 80 m in length.  
Source: same as in Table 1

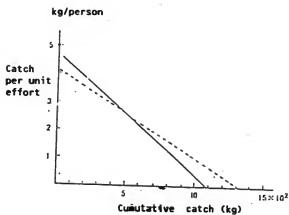


Fig. 3 Relationship between CPUE as measured by catch per fisherman and Cumulative Catch in lobster fishing Kumano region including Katsuura in 1979

Source: same as in Table 1

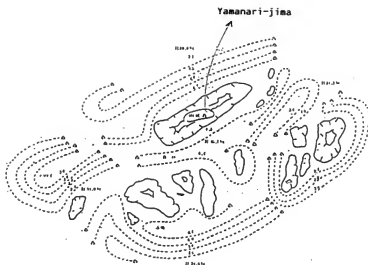


Fig. 4 Lobster gill net positions set in Yamanari island area and catch per net on November 24, 1981 operated under the pool account system

Note: ① Number of fishing vessels	19 with 55 crew
② Number of gill net used	275 Tan (5 Tan per crew)
	Tan = 80 m in length
③ Total catch	106.4 Kg

## MANAGEMENT OF CLAM FISHERY IN LAKE HAMANA

by

The Hamana Fisheries Cooperative  
Shizuoka Prefecture, Japan

### ABSTRACT

The paper describes the nature of the clam fishery on Lake Hamana, one of Japan's largest lakes, and notes that, faced by an alarming decline in catches and average shell sizes, the Hamana Fisheries Cooperative, encouraged and assisted by the Prefectural Fisheries Research Laboratory, introduced a series of management measures in the early 1980s. The management system includes size limits, daily catch limits per fisherman, days when fishing is prohibited and closed areas. License fees are used to defray the costs of re-stocking programmes. Attempts have been made to accommodate the very extensive recreational fishing and other tourist activities carried out on the lake. A key factor in the success of the management system has been the establishment of a central catch collection and recording point to ensure one marketing channel, run by the cooperative, and to improve data compilation for stock assessment. The paper examines how the various regulations have been tightened over the years and concludes by indicating further needs for stricter controls and better enforcement.

### 1. Introduction

The Hamana Fisheries Cooperative is the implementing agency for the management of the clam fishery in Lake Hamana, Japan. This paper reviews the introduction and implementation of this management programme and the leading role played by the Hamana branch of the Prefectural Fisheries Laboratory.

### 2. The fishery

Lake Hamana is one of the largest shallow brackish water lakes in Japan; it has a surface area of 6,900 ha and a narrow outlet to the sea. It is located in the center of the three metropolitan areas: Tokyo/Yokohama, Nagoya and Osaka/Kyoto/Kobe. As a result, it attracts over 2 million tourists and is crowded with 6,500 recreational boats of all kind, twice the number of fishing boats.

The most productive area for clam fishing is a sandy area in the southern part of the lake with an area of 4,000 ha (see Appendix 1). In 1983, it produced 6,365 tons of clams valued at US\$ 15 million which made this fishery the most valuable of all fisheries on the lake.



The productivity of the lake is high in the shallow southern area with a total fish and shellfish production of 205 tons per km<sup>2</sup>. Almost two-thirds of the production is composed of clam, shrimp and crab. In terms of value, clam accounted, in 1983, for 48% of the total followed by 15% for shrimp/crab, 11% for oyster and 6% for seaweed.

As shown in Appendix 2, fishing rights are granted to various shellfish fisheries.

Table 1: Annual clam production and number of clam fishermen

YEAR	CATCH (t) Index	No FISHERMEN	CATCH PER FISHERMAN (t)
1971	2.177 (100)		
1972	1.463 ( 67)		
1973	489 ( 22)		
1974	554 ( 25)	465	1.19
1975	354 ( 16)	625	0.57
1976	2.331 (107)	710	3.28
1977	1.943 ( 89)	943	2.06
1978	2.650 (122)	961	2.76
1979	2.809 (129)	1.032	2.72
1980	1.513 ( 69)	1.030	1.47
1981	3.736 (172)	1.029	3.63
1982	7.832 (360)	990	7.91
1983	6.365 (292)	966	6.59

The clam production had increased from 500 tons in the 60s to 6.400 tons in 1983 due to the effort made by the cooperative both in production and marketing (see Table 1 above).

Up to 1981, the clam fishery was left uncontrolled.

### 3. Introduction of management

The value of clams increased from Yen 60 per kg in 1930s to Yen 150 in 1977, and to Yen 288 in 1983. This increase made the fishermen aware of the importance of clam fishery and they became alarmed by the declining shell size of the catches. At the same time, the Lake Branch of the Prefectural Fishery Research Laboratory had repeatedly warned of overfishing and recommended strongly that specific management measures were needed to conserve and rebuild the resource.

When the Hamana Fisheries Cooperative was established in 1965, the size limit was raised to 3 cm from the 2 cm set previously by the Prefecture and some fishing gears were

prohibited. However, up to 1975, there was no catch limit and some fishermen earned US\$ 100,000 or more annually.

In 1976, a clam stocking programme was commenced by the cooperative. In 1977, the Prefectural Research Station started a clam stock assessment programme. In 1978, 3 closed areas were established and a catch limit of 5 bags (110 kg) per fisherman per day was set. However, proposals for closed seasons and a total catch limit were rejected at that time. Those who violated the above rules were penalized by prohibitions on their fishing activities (a ban of 3 days for the first offence, one month for the second offence, one year for the third offence). The penalty applied not only to fishermen but also to the buyer.

The stock assessment programme by the research station revealed in 1979 that the catch of one year old clams had declined sharply and the maximum daily catch per fisherman was only 2 bags. Based on these alarming signs of overfishing, the research station recommended in the same year the following management measures:

- (1) smaller size limits;
- (2) stocking and harvesting of the clam grounds by rotation;
- (3) a ban on fishing 2 days per week;
- (4) stricter control over catch statistics.

In response to those recommendations, the Cooperative adopted the following management measures in March 1980.

1. Clams less than 3 cm in length should not be harvested but released immediately.
2. Daily catch per fisherman should not exceed 5 bags of 22 kg each.
3. During the period 1 April to 30 November, no fishing on Wednesday and Saturday. For the rest of the year, no fishing on Saturday.
4. Establishment of 3 closed areas.
5. Fishing permitted only from dawn to sunset.
6. When fishing, the license flag should be shown.
7. Sorting of the catch should be done on the spot.
8. When sold, the standard sales slip should be filled in correctly, so that accurate catch data could be compiled to aid stock assessment.
9. An annual fee of Yen 15,000 levied per license to defray the cost of stocking.

10. Penalties to be imposed on those who violate the above rules.

The buyers and tourists were also notified of the no fishing days and the closed areas. A central catch collection station was established by the cooperative to ensure one marketing channel. In June, patrolling of the fishing grounds was strengthened to prevent poaching and catch offenders. In October, the closed areas were increased to five.

In 1981, the fishing time was shortened to 3 p.m. instead of sunset and the no-fishing day was changed from every Wednesday to a day preceeding holidays. The association's marketing facilities were completed resulting in increased sales. The annual levy for the stocking programme was raised to Yen 20,000. Licenses were not issued to those who did not harvest the previous year.

As a result of those measures, almost all the catch is now sold through the Association which is the first step towards efficient monitoring of the stock.

4. The current management system

Clam fishery licenses are granted only to regular members of the Association. In 1986, the Association tightened the qualification for the membership as follows:

A member should be engaged in fishing activities more than 90 days a year and his annual catch sale to the Association should be at least Yen 1,800,000 calculated as follows:

Total sale at Ass. X 45% = Yen 1,800,000  
No. of members

If such an amount is not achieved, a penalty payment of 3% on the shortfall is levied.

For members aged 70 years and above, the minimum sale is set at Yen 700,000. The required fishing days take account of the days when no fishing was possible due to certified illness or accidents.

A qualification committee was set up by the Association to review the membership annually and to make sure each fulfills all the qualifications required of a regular member. Should a member die, an heir or heress may submit an application for membership which then will be reviewed by the Committee.

There is no limitation on new entry to clam fishery provided the above qualifications are met. However, because of the tightening of the qualification, the regular members of the association decreased from 1,063 in 1979 to 966 in 1984. The size limit of 3 cm adopted in 1980 and the related limitation on fishing equipment are still in force. The five closed areas are open 1/2 days to generate funds for purchase of juvenile clams. The closed days of Saturdays and the days preceeding holidays are more for marketing reasons than for stock conservation. The shortened fishing time to 3 p.m. is also not designed to reduce fishing effort since there is a daily maximum catch per fisherman. Poaching and offenders of the rules are strictly controlled by the Association's patrol boats, sometimes with a policeman on

board. However, it is very difficult to control poaching by tourists. The only step taken was to open an area in the southern part of the lake where tourists can fish for clam at a daily fee of Yen 700-800 per person with a maximum catch of 2 kg per person.

The restocking programme is financed by the annual levy of Yen 20,000 per member and seeded 153 tons of juvenile clams (2 cm in length) in 1980, 324 tons in 1983, and 274 tons in 1984. However, with the increasing cost of juvenile clam, the amount of seeding may well decline in future. The seeding takes place in March to June.

Management policy matters are handled by the council of the Association. For the clam fishery, the Association has set up a clam fishermen association composed of 7-8 representatives each from the districts who make final decision on the management issues. It has Committees on membership qualification and on rules and surveillance.

## 5. Future issues

The strong plea from the Prefectural Fishery Laboratory for introduction of management measures was responded to by the Association. The resultant cooperation between the two, the growing awareness among the members of the economic importance of the clam fishery and the successful introduction of the exclusive collection and sale of catch by the Association are the main reasons for success of the implementation of the management measures. The first steps have been taken towards prevention of overfishing and the establishment of an organization which can implement furthermore management measures as needed.

Despite the management measures implemented, the 1985 catch declined sharply over the previous year. The research laboratory recommended stricter management measures including tighter size limitation and strict observation of closed areas. Fishermen also are control and enforcement measures are clearly needed.

Firstly, no poaching should be permitted in the closed areas. This should allow natural spawning of clam in the protected areas. Stricter night surveillance with cameras is called for.

Secondly, larger openings in the fishing gear should be introduced to permit small clams to escape.

Thirdly, over 5 years, the daily catch limit should be reduced from the present 4 bags to 3 bags. Alternatively, exclusive clam fishermen might keep the 5 bags limit but other fishermen should be limited to 3 bags.

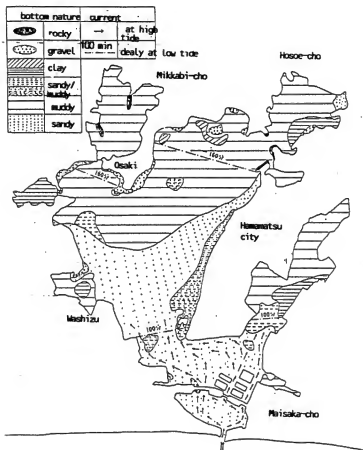
Fourthly, a one month closed season from summer to autumn should be introduced.

Finally, the closed areas should be expanded and the fee to finance the restocking programme should be increased to enable more juvenile clams to be released and seeded over a 3 year period.

As a long-term measure, total catch limitation based on scientific assessment by the prefectural laboratory should be introduced. With regard to the tourist fishing, the open area should be expanded with an increased fee which could be used for an expansion of the restocking programme.

Appendix 1

Map 1. Bottom nature and current directions in Hamana Lake

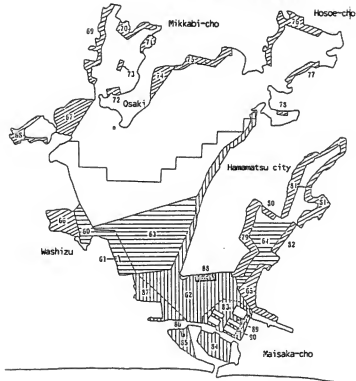


Appendix 2

Map 2. Demarcation of fishing grounds by type of aquaculture

fishery rights	seaweed	60-62-64 *
	seaweed	61-83-85-87
	oyster	61-82
	clam	89-90
	cage net	61-86-88

\*Fishing rights numbers.



## THE MANAGEMENT OF A FISHERY FOR ABALONE

by

Abe Fisheries Cooperative Association  
Tokushima Prefecture, Japan

### ABSTRACT

In Abe, a small Japanese fishing village, the main economic activity is diving for shellfish, especially abalone. In the early 1960s, as a result of easier access to a major market, there was serious over-fishing which, combined with environmental changes, led to a drastic decline in the catch of abalone. The village fisheries cooperative therefore introduced a re-stocking and environment improvement scheme and a series of management regulations. The latter included closed seasons, daily fishing times and minimum size restrictions; the right to dive for abalone was restricted solely to cooperative members and their families. As a result of these measures, the catch has recovered and fishermen's incomes notably increased. The paper concludes by suggesting that consideration should now be given to the imposition of an overall annual catch limit, the legitimisation of the use of wet suits within a pooling of catch system and the strengthening of surveillance against poaching.

### 1. Introduction

Abe District is a typical Japanese fishing village facing the Pacific Ocean with steep mountains at its back. Of the 160 families in this village, 111 were engaged in fishing in 1984; if part-time fishing families were included the number of the fishing families increases to 134 or 84% of the total. All the fishing families are members of Abe Fisheries Cooperative. The total number of the fishing boats was 121; they were all small 5GT coastal fishing boats.

The fisheries in this area are diving for abalone, topshell and tokobushi abalone; gillnetting for lobster, pole and line fishing for mackerel and chicken grunt, and harvesting of seaweed.

In 1984, the total value of catch was US\$ 2 million. Diving accounted for 56% of this total value and is the most economically important fishery. The gillnet fishery share was 23% and the pole and line fishing 9%.

All the catch is sold by the Cooperative which charges a 5% handling fee (15% for non-members), to 8 local distributors by auction.

The Cooperative also provides credit and insurance schemes to the members and buys fuel and oil for its members. It also has facilities for net drying, radio communications, cold



storage, gear storage and trucking of boats. It conducts an abalone management programme and deploys artificial reefs for line fishing. The Cooperative makes a small profit but not enough to pay a dividend.

## **2. Abalone fishery**

The coastal area of the Abe District is rich in reefs suitable for growing abalone and topshell. In the 1940s, the catch ranged from 10 to 20 tons a year but declined to less than 10 tons in the 1950s. With the introduction of the management measures as described below, the catch increased to 55/94 tons in the 1960s. It reached a peak of 95 tons in the early 1970s but declined to 30/50 tons in the 1980s. The most important shellfish is abalone which accounted for 84% of the total shellfish catch in 1984.

The diving grounds for shellfish are in the area 121 as shown in the Appendix to this paper.

The diving season is from 1 July to 24 September. Divers use a small boat as a platform and dive without wet suits; 97 such boats operated in 1984. Of 170 divers, 102 were men and 68 women aged between 18 and 67. Diving hours are between 0900 to 1500 hours for five days with an average diving time of 1 minute 30 seconds.

The catch is sold the same day and shipped to Osaka market for auction the next day. Divers' average income for this fishery is approximately US\$ 2,000 per month.

## **3. Management of the Abalone fishery**

From 1950 to 1959 the average abalone catch for the area was about 15 tons a year. In 1960 and 1961, sea grass beds in the area became depleted and with an opening of an access road to a large market, overfishing occurred and the catch plummeted to 7 tons.

Alarmed by the situation, the Fisheries Cooperative set up an abalone fishery committee in 1982 and adopted the following stocking programme and management measures:

### **(a) Stocking Programme**

- (1) with a subsidy from the Prefectural Government every year rocks were deployed to form abalone grounds until 1975 when the programme was completed.
- (2) The predators, octopus, sea urchin and starfish, were methodically removed. The Cooperative Association bought octopus at three times the market price and encouraged processing of sea urchin by women and old folks to generate an additional income for the fishing families.
- (3) An area of 4,200 km<sup>2</sup> was set aside as a growout area with a grass bed of 100,000 m<sup>2</sup> for feeding.

- (4) From 1973, juvenile abalone, and since 1981, juvenile tokobushi abalone were released on an experimental basis. Based on the result, the Association started a full stocking programme releasing 100,000 of juvenile abalone in 1981, followed by 60,000 in 1982 and 1983, 50,000 in 1981 and 70,000 in 1985.

(b) Management Measures

- (1) Only the members of the Cooperative and their immediate families and successors are qualified for abalone diving. The fishing right cannot be sold or rented to a third party. A resident of Abe District for more than one year but who is not a member of the Association may dive for abalone but the Association's sales commission will be of 15% instead of 5% for a member. Sport fishing is permitted only for people from the district and only for spear fishing of fish and sea urchin but not for abalone, topshell or tokobushi abalone.
- (2) Since 1962, the closed season has been enforced from 24 September to 14 June of the next year. In 1980, it was extended to 30 June. In 1962, fishing time was set from 0900 hours to 1500 hours.
- (3) No diving with wet suits is permitted.
- (4) Minimum length for abalone is 9 cm and tokobushi abalone 3 cm. This is strictly enforced by body check at landing site. A violator of this size limitation cannot fish for one week. From 1973, the members have taken turns to keep watch over the fishing grounds using two boats with six crews. Since 1975, a night watch was also established.
- (5) Since 1962, the Association has conducted an educational campaign to the public for the need to protect juvenile shellfish by posters, leaflets and speeches.

4. Results and future issues

In the mid 1950s, the abalone fishery declined rapidly due to overfishing but with the management measures which were introduced by the Cooperative Association in 1970/80 the catch recovered to 50 tons. Since all shellfish fetch high prices in Japan, the fishermen's income in this district has increased, surpassing the fishermen's income average in Japan. These are visible results. There are, however, some problems.

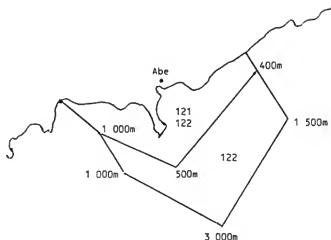
Firstly, since there is no overall catch limitation, except for size limitation and closed season, the annual catch fluctuates widely between 30 to 90 tons. It is essential, therefore that an overall catch limit should be set which will permit a sustainable yield based on scientific evidence. Once a total allowable catch is established and reached during the fishing season, fishing should stop immediately, even in the middle of the season.

Secondly, the prohibition of wet suits encourages physically stronger divers to catch more. In order to rectify the disparity and allow the use of wet suits for health reasons, a pooling of catch systems may have to be introduced or individual catch quotas established. This should satisfy every diver in the district whether strong or weak.

Thirdly, surveillance against poaching from outside must be strengthened. The cost of such surveillance should be borne equally by the members. Regulations against poaching must embrace all the Prefectures in order to ensure equal enforcement against poachers.

Appendix 1

**Map of Common Fishery Rights Fishing Grounds  
Administered by Abe Fishery Cooperative Association**



**Note:** 121 and 122 are the code number for common fishery rights which deal with reefs fishery in Abe Fishery Cooperative Association.

## MANAGEMENT ISSUES IN A DREDGE NET FISHERY FOR CLAMS

by

The Common Fishing Rights Union of Kashimanada, Japan

### ABSTRACT

The paper describes and discusses various attempts made in the Kashimanada coastal region of Japan to manage the dredge net fishery for clams, notably the Kotama sand clam. Despite basic regulations promulgated by the Prefecture and additional restrictions on fishing effort introduced by a Common Fishing Rights Union created by the five fisheries cooperatives in the area, the catch of clams declined to such an extent that fishing families' incomes seriously dropped. The Union therefore adopted further measures, in particular limits on total daily catches per boat and per district. However, rivalries and conflicting interests among the five cooperatives and their members led to the failure of this new programme after only one year. The comparative success of a clam management and marketing programme operated by a neighbouring cooperative suggests that the best results can be achieved by a single, unified cooperative rather than a group whose interests may conflict. The paper concludes by noting that more efficient management will depend upon a better knowledge of the complex biology of the Kotama clam and lists recommendations for improved clam management by the Prefectural Fishery Laboratory.

#### 1. Fisheries in Kashimanada Area

The Kashimanada area covers a sandy coast facing the Pacific ocean stretching from the town of Oarai to Namizaki and has five fisheries cooperatives (Isohama, Oarai, Namizaki, Kashimanada and Namizaki Kyori). The area is divided into three districts; Oarai, Kashima and Namizaki. Fishing boats in the area are predominately small (less than 5 GT) and are engaged in coastal fisheries: gillnetting of flounders, small shrimp trawling, trawling for white bait and a clam dredge net fishery.

#### 2. Clam Dredge Net Fishery

For many years, the shallow sandy coastal area of Kashimanada has produced good quantities of several types of clams: hard clams, surf clams, sand Kotama clam (*Gomphina melanaegis*).

The catch, however, has fluctuated widely, each clam specie having different 10 year cyclical production peaks. For example, in 1925-26 surf clams had the largest production; in 1955-65, hard clams predominated; and after 1975 the Kotama clam has been the most important. In 1976/77 and 1978, the Kotama clam resource yielded nearly 10,000 tons every year. Production came mainly from 1971 year class, but by 1977 this year class was more

or less depleted. For the 6 year period until 1977, the total catch reached 41,000 tons, valued at US\$ 17 million. Since 1977, there have been no substantial increases of the catch in any of the clams in the area.

The basic prefectural regulations on the clam fishery are as follows:

Closed season for surf clams 15 April-14 July

Closed season for clam dredge net fishery 15 April-14 July

Minimum shell length 3 cm for hard clams and Kotama clams  
7 cm for surf clams

Prohibited fishing gear: fishing by cutters

Dredge nets:

	LENGTH	TEETH*	NET MESH
Hard & Kotama clams	< 2,2 m	> 2,5 cm	> 5,5 cm
Surf clams	2 m	> 4,2 cm	> 10 cm

\* Distance between teeth

Additional management measures were adopted by the Common Fishing Rights Union which comprises 5 fisheries cooperatives in the Kashimanada area. The total number of the Union members is 750 with 349 licenses for the clam dredges net fishery. The operation of the Union is financed by a fishing fee (Yen 1,500 per family) and a levy at Yen 100,000 per fisheries cooperative.

### 3. Kotama Clam Fishery Management

To avoid overfishing of the Kotama clam, in 1975 the Union introduced the following management measures.

1. Fishing days should be only 1-2 per week for each of the 3 districts rotating among the districts.
2. Fishing hours reduced from 3 hours in July 1975, 1.5 hours in January 1976 to 1 hour in July 1976.
3. A sanctuary to protect brood stock was set up in each of the 3 districts.

4. Transfer of Kotama clam from a crowded area to less crowded area in the south in 1976.
5. An improvement of the dredge net to avoid damaging shells in 1976.
6. Stocking of juvenile clams in 1977.
7. Introduction of surveillance by the members to avoid poaching.

In addition, the Namizaki Kyoki Fisheries Cooperative independently introduced further management measures. This cooperative is the only one of the five which also covers the inland water fisheries of the Tone River for grass eel and Shijimi (*Corbicula*). For the Shijimi fishery, it has introduced a common production and marketing plan to meet the need to avoid price fluctuations, equal allotment of the catch and rotation of fishing grounds. For the grass eel fishery, it has set up a fishing gear storage depot, standardized unit prices, a common marketing system and an even distribution of the income from the catch made on unscheduled fishing days.

With a declining catch of Kotama clam, in 1980 most of the fishing families became dependent on the Fisheries Insurance Programme to make up for the diminishing income. Concerned over this situation, the Union adopted the following further limitations on the catch:

1. Fishing in the sanctuaries would be allowed once Kotama clam in those areas reached the size of over 5 cm.
2. Instead of the limitation on fishing hours, a limitation on total catch would be introduced.
3. The catch from any one district should be 40-45 tons per day.
4. The maximum allowable catch per boat per day should be 600 kg.

Unfortunately, those measures were implemented for only one year since in practice it was difficult to ensure observance of them by the five cooperatives which had conflicting interests at a time when the resource was decreasing rapidly.

The Ohtsu Fisheries Cooperative, which is not a member of the Union being located the far north of the prefectural coast line, has had better results from its Kotama clam management programme.

When, in 1979, a large resource of juvenile Kotama clam was located, it set up a closed area to protect them for 3 years. During this period, fishing was allowed only in the southern area and vessels had to return to the port by noon. In March 1980, to avoid competition at the market with the catch of the other cooperatives, fishing was permitted only on Friday each week. This helped to maintain the market price. The maximum catch per boat per day was set at 400 kg and any catch over the amount was to be released in the closed area.

When in 1981 clam poisoning occurred, due to plankton contamination, fishing was stopped immediately until October when the plankton disappeared.

In 1981/83, the northern (closed) area was opened for fishing while the southern grounds were closed. In 1981, the average catch per boat for 30 minutes time in the northern ground amounted to 500-600 kg, far in excess of the 400 kg limit. The excess clams were then released back to the closed area in the south. Since September 1982 the income from the catch has been divided equally among the members according to the average sale price.

#### 4. Future Issues

Biology of Kotama clam is not yet well understood. The clam seems to be able to grow for a number of years, 7/8 years at least. If the survival rate is high, it is definitely better to harvest them at older ages. The current maximum size limitation is 3 cm for the catching of 2/3 years old. Obviously, it should be much larger. However, as the size gets larger, the price also gets higher but not proportionally; after 6 years of growth, the price seems not to increase proportionally to the weight. The price of clam also varies according to the month as well with to the size of landings. All these points must be taken into account in establishing a proper management system.

Since productive years seem to rotate among the different clams, any new management regime should consider all the clams together and not separately. One way to increase clam resources may be to transfer juvenile clams to the area where the adult population is already thriving i.e. where optimum growing conditions appear to exist.

In principle, the management of stationary resources such as clams should be undertaken by a single fisheries cooperative and not by a group of cooperatives which have different and often conflicting interests. This is the reason why the Ohtso cooperative's management programme has worked but not the Common Fishing Rights Union's programme which failed after only one year of operation. When the resources are abundant those conflicts of interest do not arise. They come to surface when the resources become depleted and the resultant competition becomes intense.

Based on these experiences, the Prefectural Fishery Laboratory has made the following recommendations:

1. The minimum shell length for hard clam and Kotama clam should be 5 cm.
2. The minimum mesh size of the clam dredge net should be increased and a closed area should be set up to protect juvenile clams stocked.
3. A transplant of clams from the crowded area to the other should be carried out.
4. Surveillance of the closed area should be carried out by the fishery cooperative adjacent to the area. In that case in view of the costs involved, preferential fishing rights should be given.



## CATCH AND EFFORT RESTRICTIONS AS MARKETING AND MANAGEMENT TOOLS IN MANTIS SHRIMP FISHERY

by

The Shiba Branch  
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### ABSTRACT

The loss of "nori" culture grounds because of land reclamation schemes forced fishermen of the Shiba Branch of the Yokohama City FCA to turn increasingly to small trawl fisheries, especially the very valuable mantis shrimp. Greater fishing effort and improved gear led to the virtual exhaustion of the resource despite expansion of fishing activities into other parts of Tokyo Bay. When fishing was restarted after a four year interval, successive falls in prices in response to increased supplies prompted the Cooperative to introduce a daily production/shipment limitation scheme. Restrictions were placed on the permitted landings per vessel per day which, after being boiled and shucked by the fishermen in their own facilities, were then consigned by the Cooperative's marketing centre to the nearby major urban markets. This system has enabled production, CPUE and prices all to be maintained at high levels. The Cooperative has also introduced an effort control scheme based upon two days fishing followed by a non-fishing day; this has created a cost effective routine of fishing operations. These practices in the Shiba area have demonstrated that a modicum of resource management can be achieved from control measures which arose from marketing and other criteria. However, there remains an urgent need to prevent the over-exploitation and discarding of small unmarketable shrimp, perhaps by stricter mesh size controls and catch rather than landings quotas.

### Fisheries in the Shiba Area of Yokohama City

The Yokohama City Fishery Cooperative in the Kanagawa Prefecture of Japan has three branch offices at Shiba, Kanagawa and Honmaki; the headquarters are located in the Shiba Office. The three offices originally were independent fishery cooperatives. However, they were dissolved when their fishing rights ceased to exist following reclamation of sea area adjacent to the cooperatives. As a result many fishermen gave up fishing and left the area; in September 1977, the remaining fishermen of the former three cooperatives established the Yokohama City Fishery Cooperative.

Each branch office nevertheless retains its own freedom regarding fishery management in order to reflect the different geographical and socio-economic conditions of each area. Thus, the mantis shrimp fishery is independently managed by a group of mantis shrimp fishermen in the Shiba area.

Shiba is separated from other areas of the City by a small hill. Its main activities are fishery and agriculture, and the community is knit relatively tightly by traditional ways of life though, in recent years, it started to disintegrate with an influx of city dwellers and with an increasing number of old residents moving away.

Of the total 233 individual fisheries enterprises at the Cooperative, 113 belong to the Shiba area, which became the central area for fishing activities after the reclamation. Of 87 independent fishermen in the Shiba area, only four are engaged full time in fishery, others being engaged in other jobs in addition to fishery.

Shiba had been an agriculture area before and in winter Nori (laver) culture had been conducted. After the reclamation, the Nori culture grounds were lost and the culturists had to find other means of living and started fishing. The fishermen receive compensation for the reclamation of the Nori grounds and used much of the money for construction of buildings, apartments, starting retail shops, etc.,

Members of the Yokohama Cooperative are engaged in small capture fisheries such as trawl, purse seine, gill net, long line and angling and in nori culture. In capture fisheries, small trawl and purse seine account for the greatest percentages in terms of value of production. In Shiba area, the small trawl fishery accounts for particularly high percentage. Most of the trawlers are 3 to 5 gross ton vessels with 2 crew. Up to about 1971, fishing was done in only limited areas just adjacent to the coast. However, the area of operations has expanded year after year. Now it covers almost half of Tokyo Bay. Notwithstanding this expansion, fishing operations still tend to be concentrated on the coastal areas close to the Shiba port.

Though virtually the same fishing grounds are used by all the cooperative member fishermen, there are distinct differences in species composition of the catch by area. In Shiba, which accounts for over a half of the entire catch by the Cooperative, production of mantis shrimp is outstandingly high. In the Naka and Isogo areas, mantis shrimp and conger eel is important as well as flatfish.

A representative example of income and expenditure of a small scale trawl fishery enterprise in 1981 is given below:

Family Members	Member fisherman (66 years old) and his wife Son and his wife Two grandchildren Total: 6
Kinds of fisheries	Small trawl and nori culture
Persons engaged in fisheries	Member fisherman and his wife son and his wife 3 employees Total: 7
Fishing vessel owned and used	One 4.9 GT vessel
No. of days fishing	Small trawl 150 days Nori culture 40 days
Total Income from fisheries of which income from nori culture	20.000.000 Yen (10.000.000 Yen)
Total Expenditure of which:	12.615.000 Yen
employment	2.538.000 Yen
fishing vessel	1.448.000 Yen
fuel oil	1.885.000 Yen
fishing gear and materials	1.639.000 Yen
marketing commission	1.366.000 Yen
other expenses	2.308.000 Yen
depreciation	1.431.000 Yen
Net income from fisheries	7.385.000 Yen
Taxes	153.000 Yen
Disposable income	7.232.000 Yen

The disposable income of 7.232.000 Yen was more than adequate for sustaining the living costs of the family of 6 members.

#### Control over Production from the Mantis Shrimp Fishery

The environment of fishing ground in the Bay of Tokyo has greatly deteriorated during 1960 to 1970 when it recorded the worse ever conditions. Naturally the decrease in the crustacean resources in Bay of Tokyo was quite pronounced during this period and during

1971 to 1973 there were no catches of mantis shrimp at all. However the resource had begun to recover in 1974 and catches of mantis shrimp in Shiba area increased sharply thereafter.

The management and control of the mantis shrimp fishery has been developed through a combination of two measures: limitations on the amount of shrimp to be landed per vessel per day and adoption of regular "no fishing days" for every two days worked locally known as "Nikin-Ikkyu" working day system.

(a) Per Vessel Landing/Shipment Limits

It is difficult to sell live mantis shrimp direct to consumer markets because it has sharp spines on the shell. Thus, it is in general marketed in boiled and shucked (shell-removed) style, usually packed in a small box. The price of shucked meat of mantis shrimp is about three times higher than live one. It is used as material for "sushi". Shucked meat of mantis shrimp from Shiba commands a higher price at the market than those from other prefectures. The geographical proximity of Shiba to the market in Tokyo and other big cities is an advantage in marketing fishery products such as mantis shrimp because the freshness of the product is one of the big factors which determines the prices. In addition, trawl fishermen in Shiba area are said to have processing know-how to produce better quality products.

In Shiba, every trawl boat owner fisherman has his own mantis shrimp processing facility (for boiling, shucking and packing) at home. Thus, one of the characteristics of mantis shrimp fishery in the area is that the fishermen not only catch it but process it by themselves before they bring the products to the Cooperative's joint marketing centre.

They bring their product (boiled, shucked and packed mantis shrimp) to the Cooperative's product collecting centre by 7.30 p.m. of the same day they have fished. The Cooperative will then ship the products to the consignees at central wholesale markets such as in Tokyo, Kawasaki and Yokohama. The geographical proximity of Shiba to these big cities makes it possible for the products to be marketed next morning at the wholesale market in quite fresh condition.

Before 1971 when reclamation works started in Kanazawa area, the major target species of catch of the small trawl fishery had been Kuruma prawn (*Penaeus japonicus*). Since nori culture was the mainstay, fishing periods with small trawl were limited only to short five months from May to September.

The reclamation of sea areas adjacent to Shiba put an end to nori culture and in 1974 the first 4.9 GT trawl fishing vessel made of FRP was introduced which dramatically helped develop fisheries in the area. Since then the fishing ground of the small trawl fishery has expanded year after year. Today, it covers almost all the sea areas of Tokyo Bay on the Kanagawa Prefecture side from Haneda, Nakano-se shoal to sea areas towards Chiba Prefecture. The disappearance of nori culture obliged fishermen

in the area to prolong their trawl fishing periods and accordingly it is now operated all the year round.

After the reclamation and subsequent development of trawl fishery in Shiba, the target species of catch shifted from Kuruma prawn to mantis shrimp. Currently, mantis shrimp accounts for about 70% of total fisheries production in terms of value in the area.

The resources of mantis shrimp, however, sharply decreased during the years from 1970 to 1974 until production was virtually nil. From 1975, it began to be caught again and the catches continued to increase year after year: it has exceeded 1,000,000 Mai/year with CPUE high at more than roughly 150 Mai/vessel/day in recent years (see Table below). This was the result of restored levels of resource, improvements made in fishing gear, increase in fishing efforts and expansion of fishing areas.

Yearly changes in number of fishing days. Catch of Mantis Shrimp and CPUE in Small Trawl Fishery of Shiba Area. Kanagawa Prefecture, Japan

Year	Total No. of fishing days (A)	Catch in mai (B)	CPUE in mai/ vessel/day (B/A)
1965	Data not available	82.000	-----
1966	Data not available	154.000	-----
1967	6.681	177.000	26.5
1968	5.178	153.000	29.5
1969	4.631	128.000	27.7
1970	3.156	9.000	2.8
1971	2.690	-	-
1972	3.774	-	-
1973	4.463	0	0
1974	7.270	0	0
1975	6.877	10.000	1.4
1976	6.204	114.000	18.3
1977	7.096	776.000	109.4
1978	7.193	1,018.000	141.4
1978	6.870	843.000	122.7
1980	8.012	1,140.000	142.3
1981	8.160	1,385.000	169.7
1982	8.240	1,245.000	151.0
1983	(6.122)	826.000	(134.9)

- N.B. (1) Mai is a box used as a unit. One mai (box) contains processed mantis shrimp of equivalent to about 500 gram in live weight. Thus, for example, 1,000,000 mai of catch is equivalent to 500,000 Kg. of mantis shrimp in terms of live weight and 150 mai/vessel/day is equivalent to 75 kg/vessel/day.
- (2) The 1983 data refer to January to September only.

The demand for mantis shrimp per day is limited since almost all of them are used as material for Sushi, which demands highest product quality and freshness. Successive fall in prices associated with oversupply after 1975 prompted the Shiba small trawl fisherman to ask the Cooperative to devise better marketing mechanisms. Representatives of the Cooperative negotiated with consignees in Tokyo and it was agreed that daily shipments from the Cooperative to the market should be limited. This meant that the Cooperative had to introduce a landing quota and shipment limits. Thus, these limitations were introduced in Shiba from May 1977.

In the beginning, the production/shipment limit per vessel per day was set at 200 Mai, i.e. 100 Kg in terms of live weight. This was later changed to 160 Mai for 1 crew boat, 200 Mai for 2 crew and 280 Mai for 3 crew trawler.

In February 1985 it was set as follows:

150 Mai ( 75 Kg)/vessel/day for 1 crew small trawler  
200 Mai (100 Kg)/vessel/day for 2 crew small trawler  
250 Mai (125 Kg)/vessel/day for 3 crew small trawler

This production/shipment limitation worked effectively: there was no drastic increase in the catches after 1977.

Figure 1 shows monthly changes in the price of mantis shrimp after 1977. The price has been maintained at a little over average monthly level of 1977 notwithstanding the fact that the production has been on the increase. This can be interpreted that the production/shipment limitation was effective.

b) "Nikin-Ikkyu" system

The objective of the production/shipment limit was to secure favourable prices for the product. Therefore, in itself, it does not have a direct bearing upon management and conservation of the mantis shrimp resource. However, as soon as landing limit was introduced, the fishermen concerned discussed measures with which to maximize their economic returns by properly managing the resource.

The international oil crisis which caused such havoc across the world provided to this end a further incentive for this system, i.e. to save fuel oil costs by introducing non-fishing days. It was thought unnecessary to go fishing every day as long as the fishermen could get a certain level of income.

Another reason for adopting the system was to avoid loss of the resource because of "high grading"; since large size mantis shrimp commanded higher prices, small size individuals tended to be discarded before landing, which adversely affected the resource. Large size shrimp (i.e. 8 to a box), for example, fetch five times the price of small shrimp (12 to a box). Introducing non-fishing days was thus partly designed to limit such wasteful use of the resource. Since the central wholesale markets in major consumption areas like Tokyo, etc., to which they ship the products are not open on Sundays, trawl fishing is not done on Saturdays in the Shiba area. Thus, the

typical pattern of fishing calendar in Shiba as regards the small trawl fishery has become as follows:

Sunday	Fishing day
Monday	Fishing day
Tuesday	Non-fishing day
Wednesday	Fishing day
Thursday	Fishing day
Friday	Non-fishing day
Saturday	Non-fishing day

All the small trawl fishermen in the area follow this schedule. When fishing is not possible because of bad weather and typhoons, etc., the combination of non-fishing day and fishing days is changed appropriately. On average fishing is carried out four days a week, i.e. 15 to 16 days a month.

It is noteworthy that even though the number of fishing days per month has thus been reduced to half of a month, the number of fishing days per year has not significantly changed. The total number of fishing days has in fact somewhat increased after introduction of this system in 1977.

This has been made possible because after the new system was introduced, the fishermen have complied with their own rules; regular patterns in fishing activities have been established. Further, even those fishermen who had not gone fishing when weather conditions were poor, etc., came to follow the routines.

Non-fishing days are used effectively by the fishermen; they use the time for preparation work for the next days fishing, part-time work and activities of the Cooperative, etc. Thus, the most outstanding result of this Nikin-Ikkyu system (=two days fishing and one non-fishing day combination system) is the contribution it made to stabilizing a previously widely fluctuating pattern of fishing activity.

One of the important lessons arising from these practices in the Shiba area is the fact that fisheries resource management can be developed from seemingly irrelevant control measures. In the case of mantis shrimp in the Shiba area, the first measure taken was a simple landing limit aimed at maintaining favourable market prices of the product. However, this measure gave birth to the new production management method known as Nikin-Ikkyu. It is noteworthy that this practice has provided a lot of information regarding other resources such as, for example, the necessity of conserving juvenile flatfish (*Limanda yokohamae*) by closure measures, etc.,

Management of the mantis shrimp in the Shiba area has been practised on the assumption that its resource in the Bay of Tokyo can be exclusively used by the Shiba fishermen. So far, Shiba area has been outstanding for its high quality product production thanks to member fishermen owning excellent processing facilities and their technical expertise. It may, however, be possible that other areas may follow and the Shiba fishermen may not maintain their advantageous position.

Under the circumstances, some form of regulatory measures are required for the small trawl fishery among the same resource user groups such as the Shiba, Yokosuka and fisheries cooperatives in Chiba Prefecture.

A characteristic feature of Shiba is that the fishermen there have traditionally been community-minded and thus social rules can work; the decision-making process has been by discussions by all the fishermen concerned. Cooperation among the fishermen in the area has been common since nori culture days. Thus, joint activities such as joint marketing were relatively easily put into practice in the area. Technically, processing of mantis shrimp (boiling, shucking and packing) could be done by fishermen in other areas. However, it may be difficult for them to have similar collective working system as seen in Shiba. Thus, the virtual "monopoly" position of the Shiba area as shipper of quality mantis shrimp in quantity may not be easily broken for the time being.

A major continuing problem of the mantis shrimp fishery is that of high grading. The difference between catch and landing is quite large because only large size mantis shrimp are sorted from among the catches and landed; others are discarded back to the sea. Further, small mesh size nets are used when fishing is poor which catch mantis shrimp indiscriminately. These problems stand in the way of proper resource management. The decrease of CPUE after 1981 is also a matter of concern from the standpoint of resource management.

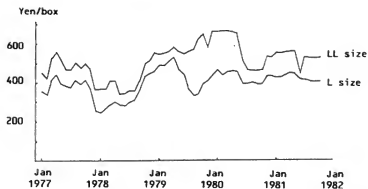
The most urgent problem for small trawlers in the Shiba area today is how to prevent overfishing of small size mantis shrimp. Thus, from the standpoint of resource management things remain to be done such as, for example, introduction of mesh size controls and catch rather than landing quotas.



Appendix 1

Fig. 1

Monthly Changes of Mantis Shrimp Price by Size



Source: Norio Koyama, 1982, The State of Small Trawl Fishery in Shiba Area, Kanagawa Prefecture.

## JOINT MANAGEMENT OF THE SCALLOP FISHERY IN NEMURO BAY

by

The Nekaikyo No.29 Committee for Joint Territorial  
Use Rights for Fisheries, Hokkaido, Japan

### ABSTRACT

Faced by a serious decline in yields from an important scallop fishery, mainly as a result of over-fishing in excess of agreed quotas, five neighbouring fisheries cooperatives sharing territorial use rights in eastern Hokkaido, decided in 1979, through their Joint Scallop Management Committee, to take the drastic step of placing an embargo on scallop fishing and of entering into a massive scallop artificial propagation programme. Over a period of four years, the grounds were cleared of star fish and seeded with infant scallops at a cost, partly subsidized by central and local government, of over US\$ 9 million. The paper describes how this very considerable investment has produced outstanding increases in output and profits. The resource is now exploited by a 4-year rotation cropping system on four growing areas. The whole operation, from dredging to marketing, is undertaken on behalf of the Joint Committee by chartered vessels from the strongest cooperative. Remarkable results have been obtained. In 1985, for example, the 16 chartered boats produced over 6,600 tons of scallops, compared with a total yield of only 2,000 tons from the efforts of over 150 vessels prior to the embargo and restocking; annual profits have risen rapidly to exceed US\$ 11 million p.a. The major issues now to be faced are the need for more effective surveillance and control against poaching and the resolution of conflicts, actual and latent, arising from different interests among the member cooperatives, especially those in respect of the gill net fishery which covers the same grounds as the scallops.

### 1. Description of fisheries in the region

The five fisheries cooperatives of Nazuke, Bekai, Wanchu, Nemuro and Habomai are located in the most eastern part of Hokkaido. They are located next to each other and enjoy jointly the territorial use rights for fisheries (TURFs) on the adjacent coastal water, which is named "No 29 Fishery Right".

As shown in Appendix 1, "No 29 Fishery Right" covers an extensive shallow coastal water from the Nozuke Peninsula to the Nemuro Peninsula, an area with high fishery productivity. The coastal area suffers from harsh cold winters and dense fog in summer and is thus suitable only for fishing activities.

The Fishery Census divides the five cooperatives area into six fishery districts. This is because the Nemuro cooperative area is divided into two: Nemuro district facing the Nemuro Bay and Hanasaki district facing the Pacific ocean. The districts of Nozuke, Bekai, Wanchu are mainly engaged in distant water fisheries while the Habomai district is mainly engaged in coastal fishing. The remaining districts conduct distant and offshore as well as coastal fisheries.

The "No 29 Fishery Right" covers fisheries for sea urchin, scallop, sea-squirt and sea cucumber, scallop being the most important. In this wide area, these fisheries compete for fishing grounds with four gillnet fisheries for flatfish, in particular in the Wanchu, Nemuro and Habomai districts which have important such fisheries.

## **2. History of the management of the scallop fishery**

Fishing for scallop by shell dredge net has been conducted from very early days. In the late 1930's, the five cooperatives introduced a total annual catch limit and a catch allocation to individual cooperatives under the guidance of the Nemuro provincial government. For example, in 1969, a Joint Scallop Resource Management Committee established a total allowable annual catch at 1,764 tons and allocated the catch to the five cooperatives according to their past performance. It also set the fishing season from 11 July to 15 September and the minimum shell size at 12 cm. Despite those efforts, the catch has declined every year to such an extent that in 1974 a total prohibition on scallop fishing had to be introduced. The reason for the failure was attributed to overfishing by some fishermen who ignored the quotas. This embargo was the turning point for the scallop fishery. Instead of depending on the natural resources, the Joint Committee decided to increase the scallop stock by artificial propagation. Using subsidies from the central and prefectural government as well as provincial government, it launched in 1979 a project of massive artificial propagation programme. It has proved to be a big success, realizing substantial profits.

## **3. Activities of the Committee**

The first activity of the Joint Committee was to prepare the grounds for propagation of scallop and, in particular, to eradicate starfish from the grounds. During the four year period starting 1979, 7,190 ha of grounds were prepared and 7,415 tons of starfish were eradicated. The total subsidized budget provided by the central, prefectural and provincial governments amounted to about US\$ 6.4 million for this operation.

In addition, the Committee financed from its own budget the preparation of 4,800 ha of ground and eradication of 2,823 tons of starfish at a total cost of US\$ 3 million. As a result, four grounds were prepared (as shown in Appendix 2) for annual rotation cropping to be conducted over 4 year period. The areas A to D were prepared by the subsidized funds while the areas a to d were done by the Committee's own funds.

The Committee then released baby scallop onto the prepared grounds. Related activities are the monitoring of growth of the released baby scallop and the control of poaching.

As can be seen from Table 1, 100 million to 160 million fry of baby scallops were released from each area at a cost of US\$ 1.9 to 3 million annually (90% of which was for

the cost of baby scallop) to be harvested four years later. Therefore, about US\$ 9 million were invested in advance of harvesting. After four years of growth, the Committee began to harvest the crop by chartering shell dredging boats from the five fishery cooperatives.

For example, in 1984 during the fishing period from 4 April to 7 August, it chartered 16 boats for a season of 86 fishing days. The total catch was 3,533 tons of live whole scallop and 219 tons of broken shell scallop. In this particular year, the Nozuke fisheries Cooperative managed the whole fishing operation and landed the catch at only one place, Yadake Numa in the Nozuke district (see Appendix 2). The objective of engaging this single cooperative to manage the whole activity from catching to marketing is to ensure an efficient operation.

Table 1

Release of Scallop Fry and Harvests					
Release				Harvests	
Year	Area	Number of fry released (1,000)	Costs <sup>1</sup> (1,000 Yen)	Year	Quantity (tons)
1979	B	88,445	250,737	1983	3,288
1980	D	121,633	295,955	1984	3,753
1981	A	106,917	237,141	1985	6,637
1982	C	160,582	388,964	1986	(7,200)
1983	B	155,255	376,569	1987	(7,000)
1984	D	122,238	336,007	1988	(7,000)
1985	A	(150,000)	(421,300)	1989	(10,000)

#### 4. Income and expenditure of the scallop fishery as managed by the Committee

Table 2 shows the income and expenditure of the Committee's scallop management programme over the three year period from 1983. The net profit increased from US\$ 3.3 million (from the B area) to US\$ 6 million in 1984 (from D area) and to US\$ 11 million in 1985.

The largest expenditure was the charter cost for 16 boats which amounted to Yen 136 million in 1984. The next largest expenditure was the incentive payment to the crew in

<sup>1</sup> Costs include the cost of growth monitoring and surveillance as well as of baby scallop.

proportion to the catch which was Yen 78 million in 1984. This included the payment of Yen 10 per kg of starfish caught and destroyed.

In 1984, a further 122 million baby scallops were released to the Area D. In addition, 12 million baby scallops of one winter old were released to the C area to supplement the existing population. The total cost of this operation in 1984 amounted to Yen 269 million, the biggest expenditure in the entire scallop propagation programme. In addition, a special starfish eradication project was undertaken in 1984 resulting in 670 tons of starfish being destroyed in areas D and B.

Table 2

Income and expenditure of Scallop Fishery (1,000 yen)			
Items	1983	1984	1985
Total Sales	1,088,458	1,488,206	2,419,690
Total Expenditure	644,192	701,222	(869,834)
Ground Maintenance	267,623	365,215	448,534
Fry Release	357,859	302,359	(375,000)
Surveillance	-	1,800	23,560
Research and others	18,710	31,848	22,740
Profit	444,266	786,984	(1,549,856)

Source: Nozuke Fishery Cooperative Association.

## 5. Profit sharing scheme

The resultant profit was divided among the five fishery cooperatives according to the established rule of the Committee as follows: Nozuke 46%, Bekai 16%, Wanchu 17%, Nemuro 12%, Habomai 9%. The same ratio also applied to the sharing of the investment cost mentioned earlier and was based mainly on the apportion of the total allowable catch among the five cooperatives in 1969.

For a further distribution of the profit within a cooperative, take the example of the Nozuke cooperative. It received about Yen 340 million in 1984. After deducting the cooperative's own expenditure incurred in connection with this operation, the net profit was divided 30% to the cooperative and 70% to the individual members of the cooperative. Thus the total amount allocated to the latter amounted to Yen 200 million (US\$ 1.5 million) which in turn was distributed to the individual members (253 members) according to the cooperative's internal rules. The individual share ranged from Yen 187,000 to 937,000 with 75% receiving more than Yen 650,000 (US\$ 5,000).

## **6. The Fishery Cooperatives and their profit sharing schemes**

The scallop propagation programme is run by the Joint Management Committee in agreement with the representatives of the five fisheries cooperatives. As the size of the programme becomes larger, the cooperatives of Nozuke, Bekai and Wanchu, which have major shares in the programme, have created a separate entity to participate in the programme called "Scallop Fishery Development Association" with a separate budget from those of the cooperatives. On the other hand, the cooperatives of Nemuro and Habomai, which have smaller shares in the programme, continue to handle it directly themselves.

The Scallop Fishery Development Association has the same objective of sound development of the scallop fishery and an increased income for individual members. However, there are differences among the members with regard to the apportionment of the equities between the cooperative and its members. The cooperatives of Nozuke and Bekai have a 30/70 ratio, while the Wanchu cooperative has 70%/30%. With regard to the apportionment of the equities among the members, they all have different points or weight systems based on such factors as the number of years engaged in scallop fishery, the number of years with the cooperative, the number of shares in the cooperative and the degree of contribution to the implementation of the programme.

## **7. Accomplishments of the Committee and the prerequisites for sustainability of its operations**

There is no doubt the Committee has done an outstanding job in realizing notable profits through the management of the scallop resources. The production target of 10,000 tons will certainly be realized. Not only greater quantity but also higher quality (in terms of lower proportion of broken shell scallop) has been realized; broken shell scallop in the total catch has dropped to only 2.5%. Since a live whole scallop fetches more than double the price of a broken one, this improvement has contributed greatly to the total income of the programme.

Table 3 shows that during 1983 and 1984, when scallop was first harvested under this management programme, the unit price substantially increased as compared to the catch from other Hokkaido areas. Encouraged by these results, there is now a plan to introduce a 5 year growth period with 5 growing grounds instead of 4 as at present. This should ensure even larger scallop which should fetch much higher prices.

Table 3

Comparison of selling prices of scallop between Nozuke Cooperative and other cooperatives in Hokkaido			
Year	Other Hokkaido area (A)	Nozuke (B)	(B) / (A)
	yen/kg	yen/kg	%
1979	252	371	142
1978	218	274	126
1979	230	290	126
1980	268	287	107
1981	251	326	130
1982	239	262	110
1983	229	337	147
1984	250	410	164

Source: Nozuke Fisheries Cooperative Association.

In order to sustain the successful operation by the Joint Committee, the following conditions need to be met:

1. The exclusive fishery right for the scallop fishery by the five fishery cooperatives must be maintained;
2. Strict control over fishing by the members should be maintained to avoid poaching;
3. The leadership of the Nozuke fishery cooperative, which depends more on scallop fishery than the others, must remain strong and sound both financially and organizationally;
4. Continued strong support for the programme from the prefectural leadership.

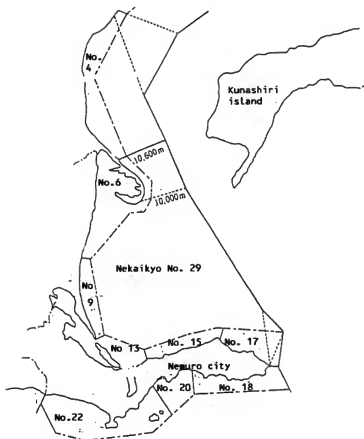
Of the above, control and surveillance is the most important. In 1965-75 only 2,000 tons of scallop were caught by 153 boats from the five cooperatives at high cost. In 1985, 6,637 tons were harvested from the prepared grounds with only 16 boats. In addition, the Committee allows only 15 boats in all to fish for scallop outside the prepared grounds. This has enabled the Committee to realize 50% cost against sales, an amazingly low figure.

## 8. Future issues

1. Despite enormous efforts of the cooperatives, poaching has not been eliminated. During the winter period (1 December to 31 March) when poaching is most rampant, the Committee has to charter a special surveillance vessel with 5 crews at the cost of US\$ 100,000.
2. The gillnet fishing for flat fish covers the same grounds as the scallop fishery and its incidental catch of scallop cannot be controlled. The problem is difficult to solve because the importance of gillnet fishing differs greatly among the five cooperatives resulting in conflicts of interest.
3. A related problem occurred when the additional fifth growing area was suggested to permit a 5 year rotation cropping system. The proposed area happened to be the best fishing ground for gillnetting, thus provoking strong opposition against the proposal from gillnet fishermen. The degree of success by the Joint Committee in overcoming those conflicts of interest among the members of its cooperatives will greatly influence the future of the Committee.
4. As profits become larger, certain criticisms and discontents as to its distribution formula among the cooperatives become greater. Further adjustments by the leadership in the interest of all will be needed.

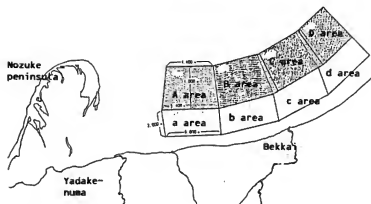


Map 1 Nekaikyo No 29 Fishery Right Area



Appendix 2

Map 2. Scallop propagation grounds  
administered by "No. 29  
Management Committee"



## THE MANAGEMENT OF YELLOWTAIL CULTURE

by

The Kobe Fishermen's Cooperative Association,  
Nagasaki Prefecture, Japan

### ABSTRACT

The Kobe Fishermen's Cooperative Association, located in Wakamatsu town, Nagasaki Prefecture, was established in 1949 and initially pursued a purse seine fishery for sardine. Overfishing and excessive investment led to a serious depletion of the resource and the eventual financial collapse of the cooperative and its membership. In 1964 a plan for the rehabilitation and re-orientation of the cooperative was accepted and assisted by the Government; the new plan provided for the development of aquaculture of yellowfin and pearl oyster. In the initial years of these new enterprises, serious organizational and environmental/disease problems were encountered. Therefore, a series of management measures - based upon environmental studies and checks and lessons learnt from study visits to successful culture establishments in the region - were introduced. Restrictions were placed upon the catch of yellowtail juveniles, in terms of season, size and total allowable quotas. Guidelines were laid down concerning the total area, individual size and location of culture pens. These regulations were controlled and monitored by a special committee of the cooperative which also provided joint purchasing of feed, centralized marketing of the catch and financial management. This management regime has been successful mainly because of standardisation of culture systems and practices, self control and monitoring by the cooperative and its members' patronage and support for the services provided by the cooperative - in short, by the application of classical cooperative movement principles and practices.

### 1. Description of the Area and the Cooperative

The Kobe Fishermen's Cooperative Association (Kobe FCA) is located in Wakamatsu town, 170 km away from Nagasaki City, in the Goto Retto islands of Nagasaki Prefecture, Kyushu island. Wakamatsu town consists of several small islands, the total area of which is 60 sq.km. with a total coastline of 170 km. Full of natural inlets, coves and indentations along the coast, the islands constituting Wakamatsu town have good natural harbours and berths for fishing vessels. All these islands are mountainous; the arable land area is no more than 2.3% in total.

After the late 1950s, the population of the town began to decrease due to outflux of labour, particularly of younger generations; during the past 28 years from 1955 to 1983, the

total population of the town decreased 45%. As of December 1983, the total population is 6,379 with 1,991 households. The major reason for this population decrease was a drop in the number of people working in the primary industry, fisheries and aquaculture. In particular, the aquaculture of yellowtail (*Seriola quinqueradiata*) constitutes the chief economic basis of Wakamatsu town, accounting for some 84% of the total value of fisheries production.

There are five fishermen's cooperatives in Wakamatsu town. The number of fisheries enterprises in 1982 was 500, of which 475 were individuals.

The Kobe FCA was established in August 1949 as a multi-purpose FCA. Initially, the major fisheries operated by the members of the cooperative was purse seine. Helped by the joint marketing of "niboshi" (boiled and dried juvenile sardine) started by Nagasaki Prefectural Federation of FCAs in 1951, the purse seine fishery flourished some years thereafter. However, a vicious circle of depletion of resource and over-investment put the purse seine fisheries into management difficulties. In 1960, two purse seine establishments became bankrupt. This was followed by further bankruptcies and retirements from fishing of purse seiners until 1964 when there were no purse seiners left.

As a result, Kobe FCA was left with considerable bad loans and financial losses. Under the circumstances, the cooperative had to receive special governmental assistance in September 1964 under the FCA Development and Promotion Act. The cooperative had to prepare a management rehabilitation plan and submit it to the government in order to receive the assistance. This was the turning point of Kobe FCA: the basic policy and new plan that it adopted was to shift from the former capture fisheries to fish culture and pearl oyster culture.

As a result, fish culture was actively promoted and prospered. Coupled with longline fisheries, aquaculture became one of the main pillars of Kobe FCA member fishermen's businesses. The rehabilitation plan went smoothly and management of Kobe FCA steadily improved. The number of members of Kobe FCA in 1983 was 282, comprising 226 regular members and 56 associate members. Approximately 90% of marketing business of the cooperative is aquaculture of yellowtail (see Table 1).

The percentage of outstanding amount of loans as against that of savings has been more than 100%. Further, outstanding borrowings have been roughly equivalent to the total savings received from the members. These facts indicate that management of yellowtail culture has not been an easy business.

As regards other activities of the cooperative, it is noteworthy that, in order to improve standards of living of its members, a tree planting programme was promoted since 1953. This movement succeeded in planting a total of 300,000 Japanese cypress, cedar and fruit trees to date. Further, a radio service, port and road construction, development of water supply facilities, construction of independent electric power plan, etc., have been implemented through the initiative of the cooperative. The Kobe FCA has played a role similar to a municipal office in this regard.

Table 1: Trend of Changes in Number of Members and Proceeds of Transactions by Division of Kobe Fishermen's Cooperative Association

	1981	1982	1983
No. of regular members	242	236	226
No. of associate members	50	51	56
Total	292	287	282
Proceeds of marketing Div.			
Total Ton	1,929 (100%)	2,110 (100%)	1,863 (100%)
of which aquaculture	1,702 ( 88%)	1,897 ( 90%)	1,730 ( 93%)
Total Mil. Yen			
of which aquaculture	1,897 (100%)	1,914 (100%)	1,519 (100%)
	1,712 ( 990%)	1,742 ( 91%)	1,400 ( 92%)
Proceeds of culture feed			
Total Ton	19,464	19,383	13,312
Mil. Yen	1,008	1,093	756
Proceeds of Supply Div.			
Total Mil. Yen	408	503	393
FCA's own business			
Total Mil. Yen	201	221	70
Outstanding amount of			
Savings (A) Mil. Yen	1,256	1,519	1,417
Loans (B) Mil. Yen	1,499	1,765	1,926
(B/A) x 100 %	119	116	136
Outstanding amount of			
Borrowings Mil. Yen	1,328	1,528	1,496

## 2. History of Yellowfin Culture and Incentives for Management

The first yellowtail culturists at Kobe FCA were five former purse seine owners. They started yellowtail culture after the FCA Development and Promotion Act was applied to the cooperative. They received individual licenses each for net pen culture but operated yellowtail culture on a joint basis. However, this joint operation did not prosper and culture activities began to be individually operated thereafter.

The number of fishermen who started net pen culture of yellowtail gradually increased to 19 by 1970/71 and 29 by 1984. All of them are under the cooperative's control and none of them are affiliated with commercial companies. This is the main factor that has helped much in promoting the aquaculture development plan of the cooperative.

From the early 1970s, however, fish diseases often occurred. Survival rates of juveniles of yellowtail decreased and growth rates of the fish began to fall. This was clearly

a sign of overcrowding and accumulation of feed and fish excretions on the sea bottom leading to depletion of oxygen. The signs of auto-pollution in net pen areas were the basic incentives for Kobe FCA to take steps to introduce various yellowtail culture management measures.

In order to establish effective management methods, study visits were made to Yusu Fishermen's Cooperative Association in Ehime Prefecture where aquaculture business was believed most developed in the region. Through this visit, the Kobe representatives learned the merits and demerits of standardization of management scales and the importance of self-management in aquaculture.

### 3. Management System

In order to sustain the development of yellowtail culture, various management measures have been implemented as follows:

#### (1) Environmental Studies

In order to understand environmental conditions on the aquaculture ground, studies have been made by such programmes as:

- 1) Aquaculture ground diagnosis program by Nagasaki Prefectural Fisheries Extension Workers Office, in which measurement is made once a year of water temperature distribution by depth, specific gravity, transparency, DO, COD and sulfide, etc.;
- 2) Culture ground patrol program by the Aquaculture Committee of Kobe FCA which is practised about twice a year.

#### (2) Restrictions on the catch of yellowtail juveniles for culture purpose

Fishing for juveniles of yellowtail (*Seriola quinqueradiata*) for aquaculture purposes is restricted in terms of fishing season, type and number of fishing vessel and quantity of catch. This is determined every year by the Prefectural Government. A yellowtail juvenile fishing license is issued by the Prefectural Government to those cooperatives whose members are engaged in yellowtail culture. Catch quota and type and number of fishing vessel for this purpose are allocated to each such cooperative. The juvenile yellowtail for aquaculture purposes must be less than 15 cm in total length. Fishing for yellowtail juvenile is in general limited for 25 days during the period from April 1 to June 30 but usually the starting date of this fishing is decided by a meeting of representatives of the Fish Culture Optimization Council of Nagasaki Prefecture (FCOC Nagasaki) and the Sea Fish Culture Council of Nagasaki Prefecture (SFCC Nagasaki).

The quality of yellowtail juvenile caught is checked by SFCC Nagasaki. This checking is done by 25 representatives from Nagasaki Prefectural Federation of FCAs, Nagasaki Prefectural Credit Federation of FCAs, Nagasaki Prefectural Mutual Insurance Cooperative Association and FCAs. For example in 1984, it was carried

out in a concerted way within the Prefecture from 13 to 25 July by dividing the 25 representatives into nine separate groups.

By doing so, number of yellowtail juveniles to be cultured is adjusted within the Prefecture. Kobe FCA, for example, received this checking team composed of five representatives designated by SFCC Nagasaki on 25 July 1984. The result of this checking was as follows:

Allocation of catch to Kobe FCA:	638,000 juveniles
Report by Kobe FCA:	638,000 juveniles
Result of checking:	644,500 juveniles
No. of yellowtail juvenile fishing operators:	29

There are cases where catches of yellowtail juveniles are less than the allocated quota. In such cases, it is possible for the cooperative concerned to receive the difference from other cooperatives if such transfer is approved by the Prefectural Government.

(3) Guidelines for Fish Culture in Nagasaki Prefecture and Aquaculture Management by the Aquaculture Committee of Kobe FCA

In March 1979, the Nagasaki Prefectural Government established a Fish Culture Guideline. This provides detailed regulations, such as:

- (1) Total area of fish pens and quantity of culture  
The total area of fish pens should be limited to less than 10% of the license area in the case of square net pens and less than 5% in the case of circular net pens.  
As regards culture quantity, the following criteria must be complied with:

Type of culture	Recommended quantity of culture	Remarks
Square shaped net pens	35 Kg/Sq.m.	10m L x 10m W x 5m D
Circular shaped net pens	70 Kg/Sq.m.	10 m Diameter x 5 m D
Enclosure by net partitions	7 Kg/Sq.m.	

(2) Position of Net Pens

Utmost care must be taken in setting fish culture net pens so as not to hinder flow of sea water: there has to be ample space between the fish net pens to allow free sea water passage.

(3) Suspension of fish culture ground use

Should the environment of the fish culture ground become degraded, use of such area must be suspended for a certain period of time as appropriate.

- (4) Other  
Recommendations regarding joint purchase of feed, how to thaw frozen feed, prevention of water contamination by thawed drips from feed, etc.

The Aquaculture Committee of Kobe FCA functions as promoter of these guidelines as well as other prefectural policies. This Committee comprises eight representatives from two areas of the cooperative. It is mainly engaged in the following activities:

- Appointment of fishing vessels to catch yellowtail juveniles;
- Monitoring of catch of yellowtail juveniles and allocation thereof to aquaculture members;
- Control of number of net pens, management and monitoring of aquaculture members;
- Fish disease countermeasures.

The Committee is given power to control, among other things, the number of fish culture net pens and yellowtail juvenile cultured so as to comply with the prefectural government guideline. The number of net pens allowed to operate in Kobe FCA is on average 13 as follows:

- |                   |                                   |         |
|-------------------|-----------------------------------|---------|
| - Square net pens | 7.5 m L x 7.5 m W x 5 m D         | 7 pens  |
| or                | 10.0 m L x 10.0 m W x 5 m D       | 7 pens  |
| - Circular pens   | 10.0 m in diameter x 5 m in depth | 6 pens  |
| Total:            |                                   | 13 pens |

Efforts have been made to standardize the number of yellowtail culture per enterprise at 17,000 fish. However, this did not succeed. Currently, there are three classes of enterprise where number of fish cultured is limited to either 15,000, 17,000 or 20,000. Thus, the difference in number of fish cultured per enterprise in Kobe FCA is 5,000 or less per establishment, which is quite small.

In addition to this, the rules of the Committee provide for the following:

- that the individual member fisherman should not be allowed to use the fishing ground for yellowtail and pearl oyster cultures at the same time.
- that the Committee must supervise the use of the culture ground by making a patrol twice a year. In particular, attendance at the time of counting of yellowtail juvenile is required.
- that if number of net pens is found in excess of the number permitted, the Committee can either suspend supply of feed to that fisherman or impose a penalty based on the size of net pens.

(4) Control of Aquaculture Management by the Cooperative

The Kobe FCA has established its own by-laws to control aquaculture management. These by-laws represent the "fish culture management policy of the Kobe FCA". The decision on any of the provisions of these by-laws is made by majority vote of directors and relate to two sections, supply of feed and loans and management.



The section on supply of feed provides for joint purchase of feed in the name of the cooperative and distribution thereof to the members in accordance with agreed number of fish to be cultured. The section on loans and management provides for maximum amount of permissible loans and credit levels for supply of feed, culture materials and chemicals, etc., based on the agreed number of fish to be cultured. The objective of these by-laws is thus to secure viability of yellowtail culture by member fishermen, at the same time establishing the sound financial management of the cooperative.

#### (5) Cooperative's Collecting and Marketing of Cultured Yellowtail

In the Kobe FCA, the collection and marketing of cultured yellowtail are done solely by the cooperative. The cooperative's role as culture ground watchdog, supplier of feed and provider of finance makes it possible for the cooperative to control quantity of fish culture and use of fishing ground in a harmonious way.

#### 4. Effect of the Management

One of the effects of the management of aquaculture by the Kobe FCA is that there has been no occurrence of red tide and neither has there been any sign of environmental degradation in the culture ground areas.

The harvesting and sales of yellowtail from the Kobe FCA have been stable for the past five years. This is because culture net pens and culture practice have been strictly checked to protect the aquaculture environment.

It is a fact that in the Kobe FCA, nearly 20 years have passed without having any environmental problems in fish culture. However, it must be remembered that the flow of sea current where the yellowtail culture has been carried out is 5 knots per hour, which is relatively fast. Accordingly, as regards environmental degradation of the aquaculture ground, further on-site studies must be continued to check the actual state of conditions.

Another effect of the management of aquaculture in the Kobe FCA is that the management has been stable both in terms of order of fishing ground use and economic viability. Since 1981, there have been many bankruptcies of yellowtail culture fishermen in other cooperatives due primarily to decline of prices of cultured fish. However, the proceeds from cultured yellowtail by the Kobe FCA have been maintained at a high level compared to other cooperatives. Despite the stagnant prices of cultured yellowtail in 1983, the percentage decrease in the sales at Kobe FCA was lowest in the region. Clearly, a positive management effect must be recognized here.

It is necessary, however, to analyze the cause of this viability from the standpoint of whether it has been made possible by the cooperative's management of aquaculture, good fishing ground conditions, or high technical expertise by each member fisherman, etc.

## 5. Factors which make effective management possible

The following points may be regarded as the indispensable factors which have made the management of aquaculture in the Kobe FCA viable:

- Standardization of management scale per fisherman
- Self-control in the management of aquaculture promoted by the Aquaculture Committee
- Member fishermen's complete patronage/use of the cooperative's services
- Devotion of directors and staff of the cooperative to improvement of the cooperative's business

In short, implementation of cooperative movement principles has helped greatly in making the aquaculture management successful.

## 6. Problems and Future Issues

Among the main problems of aquaculture are survival rate and feed conversion efficiency. Through exact counting has not been made, it is estimated that in the Kobe FCA the survival rate in the initial acclimatization to feeding stage is on average about 70% and in the first years about 80 to 90%. These are good compared to those of neighbouring cooperatives where the survival rate at acclimatization stage is generally less than 50%. However, it is apparent that the feed conversion efficiency in the Kobe FCA areas is poor, averaging around 12.5% in one year old fish and 10.5% in two year olds. This may be attributable to a technical failure, i.e. the culture net pen and feed preparation place are annexed. Namely, frozen fish (feed) are thawed just next to the net pens, polluting the culture ground.

It also seems that despite the fact that there has not been serious damage caused by self-pollution and degradation of culture ground environment, the environmental conditions have been progressively on the decline. Overcrowding has been pointed out as one of the causes for this. The number of fish allocated to the Kobe FCA is 1,120,000 fish (638,000 one year old fish and 482,000 two year old fish). However, it has been pointed out that 1.5 to 1.6 million fish may actually be cultured, leading to overcrowding.

Another problem is the instability arising from fluctuations in the prices of feed and yellowtail. Accordingly, it is necessary to take into account the future issues:

- (1) Catching of yellowtail fry and juveniles which have been done by member fishermen on an individual basis must be taken over by the cooperative. The initial feeding process should also be done by the cooperative. Further, the feed preparation place must be set up at a different place from the culture facilities.
- (2) Number of fish cultured per net pen should be reduced.

- (3) The optimum scale of business must be worked out as a model, taking into consideration optimum levels of culture per net pen. Thus, in order to allocate the used fishing ground fairly among the member fishermen, certain limits to the scale of enterprise per individual must be introduced.

## A MOVEMENT TO PROMOTE INTEGRATED FISHERY MANAGEMENT

by

The Kagawa Fisheries Development Thinking Society  
Shikoku Island, Japan

### ABSTRACT

In 1983 an unusual approach towards more effective and better integrated fishery management was initiated by fishermen's cooperatives in the Kagawa Prefecture with government support. The Kagawa Prefecture faces the Seto Inland Sea whose complex fisheries present particularly difficult problems of management. It was therefore decided to create a Kagawa Fisheries Development Thinking Society (KFDTs) to facilitate the exchange of information, set overall management objectives and make recommendations for the better management of the resources throughout the region. Implementation of the recommended management measures remains, however, the duty and responsibility of the cooperatives or their specialized joint study groups and committees. The KFDTs set up a number of sub-committees to deal with specific fisheries. These sub-committees, whose members are representatives from the cooperatives in the region, make detailed studies and guidelines which are then adopted and put into effect by the individual cooperatives concerned. The most active of these sub-committees, that dealing with small trawl fisheries has, for example, made a series of important recommendations for self-regulatory limitations on fishing effort and methods which have been strictly observed by member cooperatives. These attempts by the KFDTs to encourage an integrated, overall approach to the management of complex fisheries present a noteworthy example of management from within rather than in response to external pressures by government or higher authorities.

### 1. Introduction

The "Kagawa Fisheries Development Thinking Society (KFDTs)" was established in September 1983 as a non-governmental voluntary organization within the Kagawa Prefecture to jointly consider and promote fishery management. KFDTs works as an organization for facilitating exchange of information on fishery management and setting objectives for management. It is not an organization set up to implement fishery management measures since the management itself is done by fishermen's cooperatives and their subsidiary organizations such as specific fishery management study groups or "committees".

It is a difficult proposition to ensure effective resource management concerning finfish stocks, particularly migratory species of fish, unless they are managed over wider areas than

those covering a given cooperative's area. By managing migratory species of fish through voluntary cooperation among the cooperatives, fishermen's groups and other non-governmental organizations under the joint agreement of KFDTS, it may be possible for individual Fishermens Cooperative Associations (FCAs) or fishery management study groups within the FCAs to achieve fisheries management.

Kagawa Prefecture is in Shikoku island and faces the Seto Inland Sea. Fisheries in the Seto Inland Sea are complex and to manage fisheries resources there is a difficult proposition. It is from this standpoint that attention has been paid to the activities of KFDTS.

## 2. Incentives for Establishment of KFDTS

There was no specific reason for establishing KFDTS. It was, rather, the gradual decline in the economic viability of fisheries within the prefecture year after year and pioneering fishery management activities by some of the FCAs which combined to motivate the establishment of the Kagawa Fisheries Development Thinking Society.

In other words, awareness of the need for fisheries management on the part of the fishermen was a major factor behind this establishment. However, it was the Kagawa Prefectural Government that first proposed the creation of the KFDTS. Helped by logistic support from the prefectural government, KFDTS was established by the prefectural government, federations of FCAs and primary level fishermen's cooperatives. Although the original proposal for the establishment of KFDTS was made by the prefectural government, it was created on the principle that non-governmental fisheries organizations can take the initiative in such activities.

## 3. Organizational Structure of KFDTS

The Secretariat of KFDTS is within the Kagawa Fisheries Promotion Association which was established in 1950. KFDTS has a "Project Team" which is similar to a planning board to draft basic policies of KFDTS, its organizational structure and business plan. It consists of 16 members: six from the prefectural government and 10 from fisheries organizations. The decision-making body of KFDTS is the "Representative Members Meeting" (RMM) consisting of 16 representatives: the president of the Kagawa Prefectural Federation of FCAs and 15 chairmen of FCAs, representing each area. Here, the business plan, etc. of KFDTS is decided.

Under RMM, various committees have been established by type of fisheries, as follows:

- Small Trawl Committee
- "Komase Ami" Committee  
(Komase Ami is also known as "Fukuro Machi Ami". This is the fishing net something like the shape of an anglerfish the mouth of which is wide open. The bottom of the mouth area is attached with sinkers with both ends fixed with anchors while the upper part of the mouth close to sea surface is held by

the boats on both sides. The tail part corresponds to the cod end. Fishing by this gear is done during the time between high tide and low tide. This is a fishing method to catch fish by utilizing the flow of current. No lures or bait are used).

- Set Net Committee
- Spanish Mackerel Drift Gill Net Committee

The objective of these Committees is to take appropriate fishery management initiatives within the prefecture. The characteristic feature common to each of these committees is that sub-committees are established in several regions within the prefecture. Each sub-committee comprises a certain number of representatives of fishermen from the FCAs within the sub-committee region.

#### 4. Results of Fishery Management Promotion Movement

One of the activities of KFDTS is to recommend self-regulatory measures concerning fisheries management. Examples are as follows:

##### (1) Small Trawl Committee

The Small Trawl Committee recommended the following items in September 1983.

##### (i) Self-regulatory measures

- Limitation of fishing operation hours and number of fishing days;
- Limitation of fishing season and area;
- Limitation of mesh size;
- Expansion of closed areas, etc.;
- Prohibition on landing of juvenile fish.

##### (ii) Other

- To explore possibilities of regulatory arrangements with adjacent prefectures concerning small trawl fisheries;
- Strengthening of patrols, etc.;
- To request buyers in the fish market not to buy juvenile fish.

The representatives of the Small-Trawl Sub-Committees of five regions met two years later in September 1985 and each reported on their activities based on the recommendations. As a result, resource conservation efforts have been put into practice such as enlargement of mesh size of cod end in all five sub-committee regions. Further, prohibition of landing of juvenile fishes has been strictly observed. It should be particularly noted that in 1986 the Small Trawl Committee agreed to impose voluntary size control on 29 species. In order to implement this, real size drawings by species have been distributed to all the fishermen and fish markets. Such

self-imposed size regulations were, in fact, stricter than those set by the competent authorities.

Other Committees have also made efforts to manage the resources, as follows:

(2) Komase Ami Committee

Discussions were held on enlarging the mesh size of the cod end of the net in cooperation with a similar committee in the Okayama prefecture. However, agreement was not reached though efforts have been continued to try to find better ways to manage resources.

(3) Set Net Committee

In Mitoyo, one of the regions in Kagawa prefecture, the Set Net Sub-Committee agreed to release to the sea all species of fish caught smaller than 13cm in total length (smaller than 9cm in fork length). It was also agreed to release blue crab if they had eggs.

(4) Spanish Mackerel Drift Gill Net Committee

In three regions of Kagawa prefecture, Sub-Committees on Spanish Mackerel Drift Net have discussed the enlargement of mesh size, abstention from fishing on Saturdays and bans on the use of improved purse seine type gill net.

5. An Example of Fisheries Management

The recommendations of sub-committees have been put into practice by individual fishermen's cooperatives. One such example is that of the "Small Trawl Management Study Group" of the Aji Fishermen's Cooperative Association.

All the trawlers of Aji FCA, namely 168 vessels, were members of the Small Trawl Management Study Group of the Cooperative as of the end of 1985. The group consists of trawl vessel owners of seven areas in Aji FCA. In line with the guidelines/recommendations of the Small Trawl Sub-Committee in the region, the Group established its own rules on 4 May 1986 as follows:

- (1) Adoption of a five day week (from May 11, 1986).
- (2) Adoption of fixed working hours.
  - For vessels fishing in day time      -leave port at 3 am and arrive back at 6 pm
  - For vessels fishing in the night      -leave port at 3 pm and arrive back at 5 am
- (3) To actively carry out intermediate culture of juvenile fishes for stocking purposes.
- (4) Conservation of parent stock, including ban on selling of blue crab with eggs.
- (5) Size limit of catch (29 species).

- (6) Penal provisions such as confiscation of catch, suspension of fishing operations, etc.

In addition, such issues as restrictions on fishing gear, introduction of conservation area and operation of fishing ground patrols, etc., were included in the rules as pending questions which required further efforts to realize better fishery management. As regards size limit of catch, etc., the staff of the Cooperative play an important role in ensuring that member fishermen comply with their own rules.

## 6. Conclusion

The objective of Kagawa Fisheries Development Thinking Society (KFDTS) is to take an integrated approach to fishery management within Kagawa prefecture. The history of KFDTS is short and therefore early assessments are not possible. However, this approach is worthy of attention as a means of establishing fishery management of migratory fish from within, rather than from pressure of the government authorities.

These attempts by KFDTS may provide important clues for the further institutionalizing of fishery management of finfish and/or migratory fish resources.



## AN ANALYSIS OF CASE STUDIES ON JAPANESE EXPERIENCE IN COASTAL FISHERY MANAGEMENT

by

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### ABSTRACT

An examination of experiences in coastal fisheries management in Japan reveals that both the objectives and methods of management vary considerably from location to location because of differing topographical, socio-economic and environmental conditions. The paper discusses various management measures in three types of fishery: reef fishing for generally sedentary species, off-shore fisheries for mobile species and aquaculture. The analysis of case studies (i.e. FI:CCFM/92/Exp.1-12) identifies a number of closely linked management methods. There are those concerned with the conservation and protection of the resources themselves i.e. limitations on capture size, restrictions on gears and fishing methods, closed areas and seasons, catch quotas, release of fry to enhance the stocks, controls over sport fishing and poaching. Other measures relate principally to controls over production methods such as restrictions upon vessels and crew, the style and frequency of fishing including rotational and collective fishing systems, and steps to promote stability in fish prices. Aquaculture management systems relate mainly to the preservation of environmental quality and are best achieved through collective, cooperative mechanisms embracing all aspects of aquacultural operations from selection and purchase of seed to equipment and marketing. Whatever the type of fishery, the common objective of the management methods examined was the maximization of economic returns within the context of a sustainable fishery.

## **INTRODUCTION**

It is commonly recognized that the regulation of fishing effort is needed for conservation of fish stocks. However, the objectives and methods of coastal fishery management differ greatly according to the locality because of different topographic, socio-economic and environmental conditions. Coastal fishery management measures implemented in Japan can be broadly categorized into three by type of fishery, namely:

- A. Reef fishery management
- B. Mobile species inshore fisheries
- C. Aquaculture management

### **A. Reef fishery management**

It is worthy of note that in Japan management measures have been frequently initiated by fishermen themselves. There are various reasons for this but the most common ones are the reduction in the size of fishing grounds, the increase in the number of fishermen, dwindling trends in the income of fishermen, cutthroat competition in fishing and fishermen's concern over the depletion of fish stocks. Management measures implemented, thus, take different approaches to achieve the common objective, that is, the maximization of economic returns under sustainable fishery environments.

Aquatic animals and plants harvested on and around reefs are generally sedentary and therefore the inter-relation between fishing effort and stocks is fairly well known by local fishermen. This fact has enabled the Government and community organizations to get relatively easily the consent of fishermen to implement regulatory measures. Such measures are normally established in collaboration with the national and prefectural research stations. Reef fishery management methods are varied depending upon the area of emphasis and can be grouped into three categories, which are not mutually exclusive but closely linked.

- 1. Protection of biological resources
- 2. Control of production methods
- 3. Entrepreneurship development

#### **1. Protection of biological resources**

##### **Body size limit**

The body size limit is often adopted as a technique for some specific species such as abalone and lobster. It works by prohibiting the sale of individuals smaller than a prescribed body size. However, problems sometimes occur. For example, gillnets are generally used to catch lobsters, but it is

inevitable that under-sized lobster is also caught by accident. In this instance, how to deal with them becomes a problem. One way practised is that fishermen release them immediately into the sea; the other is that local institutions or cooperatives buy them at agreed prices to rear in breeding ponds and at a later stage set them free into the sea.

#### Limit to gear and methods

The task of controlling fishing effort by this method differs greatly according to the region. Take abalone fishing for example, where both diving and the use of spears from a boat are commonly carried out. For diving, there are varied restrictions on the use of scuba equipment, suits and tools. Such restrictions vary also with the depth of water where harvesting is carried out. The purpose of this regulatory method is to exclude gears and methods of high efficiency in an attempt to prevent overfishing.

#### Closure and area separation

Closure to fishing is a standard management tool designed to protect spawning areas or the capture of juvenile species. This method is particularly important when fish farming or the release of fry or seeds are implemented. In some cases closure to fishing is done every other year or once in several years depending upon the frequency of fishing. Area separation ensures that fishing areas or zones established for specific gear types or types of fishermen are protected from other fishermen.

#### Closed season

The establishment of fishing seasons aims at sustaining the reproduction of resources by protecting the growth of eggs and juveniles. In the case of shellfish (e.g. abalone, short-neck clam) harvesting is prohibited during spawning and subsequent growth periods. Such bans are sometimes imposed because of economic reasons; shellfish are not taken when prices are low (e.g. in summer for Japan) and when they perish easily once taken out of the water.

#### Catch quota

The total allowable catch for a single stock is determined and shares of that total quantity are allocated to individual fishermen or vessels. Sometimes, limits are imposed on a daily basis. The fishermen are then free to take their shares in the specified areas with specified means. Since their total catches are fixed, they will seek to take them at the lowest cost. This system is generally used for single species fisheries (or for fisheries making use of only two or three species) and in a situation where the total allowable catch can be estimated satisfactorily and where the catches of individual fishermen can be fully monitored.

When individual quotas are fixed, it considerably reduces competition among fishermen and this prevents them from resorting to excessive investment. Setting a limit to daily landings contributes to stabilizing prices of target species. Assistance from research institutes is needed to determine the annual total allowable catch.

#### Enhancement of fish stocks

Fish farming or the release of fry and seeds is a sort of support activity to fishery management as it contributes to sustaining the magnitude of stocks. In the initial stage of development, the Government and research institutes need to provide financial and technical assistance to fishermen, whereas they should become self-reliant at a later stage both financially and technically. Commissions for marketing fish and levies to fishermen which are collected by cooperatives are an important source of finance for this activity.

#### Restrictions on sport fishing

Sport fishermen are not allowed to harvest high-value species such as abalone and lobster. Severe restrictions are also imposed on fishermen to catch these species since the resources are limited and offer an important source of income for fishermen.

#### Prevention of poaching

Poaching tends to target high-value species such as lobster, abalone, etc., which inhabit reefs and in their surroundings to which people have easy access. Poaching takes place indiscriminately even for under-sized species. Prevention of poaching is, therefore, an important factor in effective fishery management. Poaching is done by both fishermen and non-fishermen. Fishermen poachers could be both residents and non-residents. The most common offenses include harvesting in closed areas and seasons, and the use of banned gears and equipment. Poaching is often carried out by non-fishermen as well as sport fishermen. The task of enforcement by the government is costly as it involves surveillance by patrol boats and government officials. Surveillance by fishermen or fisheries cooperatives is more efficient and cost-effective, and needs to be promoted.

## 2. Control of production methods

The number of fishermen who are engaged in reef fisheries is often excessive compared to the size of the stocks. It is, therefore, important to regulate production methods.

### Qualifications

Fishermen are required to meet qualifications established for operating the fishing in question. Such qualifications may differ according to the species to be caught, community structure and customs and the number of fishermen. Qualifications need to be revised from time to time to cope with the current problems and situation.

### Vessels and crew

When the total allowable catch is fixed, but the individual quota is not established, there are restrictions on the number of fishermen per vessel to maintain the equity in competition. In diving there is no particular restriction on the size of a boat since it does not affect the quantity of catches.

### Fishing days, hours and the number of fishing operations

When individual quotas are not allocated within the total allowable catch, there are usually severe restrictions on the number of fishing days and hours. In abalone diving for instance, fishing is limited to day-time only and this arrangement helps to keep fishing effort at a lower level.

## 3. Entrepreneurship development

Restrictions are imposed in the use of fishing grounds in order to improve fishermen's income. The following two cases may be relevant.

### Area separation

The Ohama Fishery Cooperative (FI:CCFM/92/Exp.6) has been implementing area separation in its short-neck clam fishery to achieve equitable distribution of income among fishermen and guarantee minimum level of earnings. In 1971, the Cooperative divided the short-neck clam fishing ground into two sections; one was designated as a common harvesting and the other was an individual section, both sections being administered by the Cooperative.

The value of sea beds was assessed prior to this area separation. The offshore side of the sea beds, where it normally took six months before seeds attained a marketable size, was considered more fertile, and that area was demarcated as a common harvesting section. The shoreside of the sea beds where the growth of the clam was slower, was individually distributed to fishermen by a lottery. The catch quota was also established (i.e., 8 bags per household per day in the individual section and 3 bags in the common area). Daily quotas were established with a certain degree of flexibility depending upon the market demand. The quota allocation and the lottery system were found effective to achieve the equal distribution of resources in a fair manner.

### Fishing by rotation

Lobster is normally taken by a bottom gillnet. Fishermen set the net at dusk and haul it at dawn in the following morning. If fishermen can secure good spots, they can get better catches. To prevent fishermen from rushing to more favourable spots, a lottery is carried out so that they may enjoy equal privileges (FI:CCFM/92/Exp1). Often, also a system called "fishing by rotation" is adopted where fishing spots are rotated among fishermen. This system has the merit of giving equal chances to fishermen in operating on more fertile areas, although it is not a panacea because experience shows that those who are given fertile spots earlier normally could yield higher catches. In order to overcome these problems, an additional measure "collective fishing" was introduced.

In this system, the income is equally divided among participants according to the number of fishing days. This system also generates the awareness among fishermen about the need for resource conservation and reducing illegal fishing and competition is no longer likely to take place. To implement this system, the following conditions need to be met.

- (a) The scale of production should be almost equal: individual incomes vary according to production costs when turnovers that fishermen obtain are equal. If there are great gaps in production costs among fishermen, the net income would differ substantially and this may not fulfil the aim of this measure - the equal distribution of income.
- (b) The degree of dependence of fishermen on the fishery in question should be more or less equal in terms of income: if the relevant fishery, say, lobster gillnet fishing is the main activity for certain fishermen but an ancillary fishing for others and yet the turnover is distributed equally among participating fishermen, a feeling of unfairness may be created.

"Fishing by rotation" may have the merits of securing safety in fishing; equal utilization of resources; use of under-utilized resources; and maintaining adequate levels of fish prices and increasing the added value.

### B. Mobile species inshore fishery management

Inshore fishery which aims at catching mobile finfish is characterized as being extensive in its fishing areas, in contrast with reef fishery and this makes it difficult to establish management measures since it is impossible to demarcate fishing grounds. Target species migrate beyond the boundary of jurisdiction areas administered by individual fisheries cooperatives. It is, therefore, important to form a regional management body which may be responsible for the planning and implementation of regulatory measures. Whilst there is no legal backup for

establishing such bodies under the existing fishery legal framework, fisheries cooperatives often voluntarily establish a regional management body to solve conflicts among fishermen from different regions. Existing measures fall into four categories according to the area of emphasis. These are:

1. Establishment of disciplines in fishing grounds.
2. Fish price stabilization.
3. Resource conservation.
4. Enhancement of fish stocks.

#### 1. Establishment of disciplines in fishing grounds

##### Fishing by rotation

As in the case of reef fisheries, this method is also adopted in fishing boat fishery which exploit mobile species. A good example is seen in red snapper floating longline fishing in the Yamagata Prefecture (FI:CCFM/92/Exp.1). A good fishing ground for snapper was located at some 9 miles off the coast in the southern part of the Prefecture, but the fishing ground measured only some 3.3 km north-south and 1 km east-west and a total of about 30 boats were able to operate together in the fishing ground. When this regulatory measure was introduced in 1960, there were 82 boats which were engaged in this fishing (the number decreased to 61 in 1985).

The key element of this method was to aim at limiting the number of boats to 30. Only 30 boats were allowed to enter fishing ground and the remaining boats had to suspend fishing every other day or every two days. Regulations were also established on the specifications of gears, fishing season, hours and the penalty.

##### Collective fishing

The abundance of fish stocks varies even within the same fishing ground. It is natural that the most abundant spots should be first sought by every vessel. As a consequence, the fishing productivity at more fertile spots gradually decreases and finally the fertility becomes equal throughout the fishing area and vessels are equally spread in the waters. This is a common pattern which occurs in fishing grounds and it leads to the levelling off of labour productivity of each vessel. This means that the difference in the abundance of resources cannot be expressed in terms of labour productivity but rather as the difference in the number of fishing vessels which entered in the fishery. This pattern of fishing, or free competition in specific waters, tends to diminish or eliminate the economic potential of fishing grounds. Free fishing in specific waters eventually results in the equalization of production for each vessel. However, if vessels are deployed in such a manner that the equalization of marginal production may take place, then the total returns from the fishing ground could be increased to the maximum

point leading to the most effective utilization of resources from the economic point of view.

A good example can be seen in cod bottom trawl fishery management implemented in the Akita Prefecture. In 1977, "collective fishing" became operational to overcome problems which had arisen from excessive competition among 19 trawlers on the cod fishing ground seeking the most favourable spot. A dense school of fish migrated to the very small area and therefore as the number of trawls cast increased, the productivity per boat drastically decreased. There was severe competition to secure the favourable spots and to enjoy the first haul. The vessels used to arrive on the fishing ground at midnight to wait for dawn to start fishing. This caused problems in respect of fuel consumption, labour burden and risks of danger due to the congestion in the fishing ground.

"Collective fishing" was then initiated by the Cooperative where the proceeds from all the vessels were pooled and distributed to all participating vessels on an equal basis after the expenditures were deducted. It was evident that no increase would be made in total catches if 19 vessels operated together because the fishing ground was so small and an additional unit of input would no longer lead to any increase in total catches. Thus any increase of vessels beyond 6 was found to be unproductive as it did not necessarily increase the total catch. It was therefore decided that only six vessels would operate cod fishing by rotation and the other 13 vessels would catch flounder and other demersal species in other fishing grounds.

This method generates positive effects in respect of energy savings (by 30 %), alleviation of physical and mental burdens, prevention of sea accidents, eliminating marketing responsibilities, increase in productivity through the improved exchange of information.

## 2. Fish price stabilization

Restrictions on catches are effective not only to restore the poor state of stocks but also to maintain the level of fish prices.

### Catch quota

A typical example can be observed in the regulatory measures implemented by Shiba Fishery Cooperative in Yokohama city (FI:CCFM/92/Exp.9). There were 173 fishermen who owned bottom trawlers whose GRT ranged from 3 to 5 tons. The majority of the vessels were manned by two fishermen. There were small differences in the scale of vessels and the crew number. The main species caught was Mantis shrimp which was processed and packed by local fish processors for the shipment to consuming centres. Mantis shrimp is a high-value species used by Sushi shops, but the size of the market was relatively small. Under such circumstances, it is likely that if daily supplies exceed a certain level, prices would go down. The price drastically dropped in 1975 on account of over supplies. To cope with this problem a quota



system was introduced in 1977. The quota has varied with the time. As of 1985 the daily quota was set at 150 boxes (one box contains processed mantis shrimp of 500 grams in live weight) for a vessel manned by one person; 200 boxes for a vessel manned by two persons and 250 boxes for a vessel manned by 3 persons.

This system has further been developed into new phases where they established "two-day fishing and one-day rest" system. It was found necessary to set up a non-fishing day to maintain the prices at an adequate level. This arrangement consequently contributed to saving fuel costs and also provided opportunities for fishermen to operate other types of fishing or aquaculture or to work on land.

### Collective fishing

A good example of "collective fishing", which contributed to fish price stabilization, can be seen in stardust shrimp two-boat trawl fishing in Suruga Bay of Shizuoka Prefecture (FI:CCFM/92/Exp.3). Collective fishing in Suruga Bay commenced in 1966 to control fishing effort by limiting fishing hours. At present, three fisheries cooperatives with a total number of 120 vessels jointly implement these management measures. A Committee comprising representatives from each cooperative decides on fishing plans every day with regard to: (i) whether fishing should be carried out or not; (ii) departure time from the port; (iii) the position of vessels on the fishing grounds; (iv) a daily catch quota for each vessel; and (v) landing port. The Committee consists of 21 members and their term of office is 3 years. The sharing system of the profit is as follows:

Daily proceeds are pooled in a common account. Expenditures are deducted from the total sales of catches. The balance is divided between the boat owner and the crew with the ratio of 40 and 60 percent. The major items of expenditure are commissions to cooperatives (3%), fuel, ice, depreciation and repair of fish finders. The main purpose of implementing this method is to maintain fish prices at an adequate level. This system has generated various positive effects such as bringing discipline in fishing operations, the decrease of operational costs, labour savings; thus, it has enhanced the productivity of labour and capital.

"Collective fishing" operated by mid-water trawlers in Toyohama, Aichi Prefecture is also an interesting case. The shift from purse seines to mid-water trawl nets took place in 1975 to reduce the scale of operation to cope with the large decline of sardine prices as a result of the abundant catches. Sardine taken by purse seines were mostly reduced to fish meal, and their prices fluctuated considerably. To acquire more stable prices, boat owners shifted from purse seines to mid-water trawl nets to produce higher quality sardine directed to human consumption, prices of which were much higher than those of sardine reduced to fish meal. This change of production method has enabled them to transfer fish to carrier vessels without damaging or perishing the fish and keeping them alive. "Collective fishing" proved to be suitable for producing quality fish as "individual

fishing" tends to place a greater emphasis on the quantity rather than the quality as it is carried out in a competitive manner.

In Toyohama, arrangements for implementing management measures were as follows.

- (a) The composition of vessels which participated in collective fishing was 14 fleets with 45 vessels (28 mid-water trawlers and 17 carrier vessels) with 95 crew members.
- (b) The distribution of income was made as follows: the entire sales were pooled in a common account from which commissions to the cooperatives, as well as expenditures for fuel, ice, food, fish finder recording papers and other expendables were deducted. The balance was divided between the boat owner and the crew at the ratio of 50 percent each.
- (c) The period of "collective fishing" was from April to November which corresponded to sardine fishing season. In the rest of the year, fishermen operated individually another type of fishing. On average, the income derived from "collective fishing" represented 80-90 percent of their annual income.
- (d) The particulars of the system were revised every week. On Friday of each week, the boat owners met to review the catches and the problems encountered during the week and discussed plans for the following week including the need to extend the operation of "collective fishing".
- (e) A regular meeting was held with the representatives from the cooperatives, fish processors and fish buyers to establish daily, monthly and annual plans for production.
- (f) The daily operation was carried out in this manner:
  - effective network of communication was established between the fleets and the office on land;
  - an efficient coordination was established between fishing boats and carrier vessels to minimize transport hours of fish;
  - fish were kept alive in fish holds containing iced water.

As a result, it was observed that the economic effects of this measure were significant in terms of the value of landings, labour productivity, savings in production costs (by about 30 percent).

### 3. Resource conservation

Management measures, implemented in Fukushima Prefecture by the use of a larger mesh size for bottom gillnets, have brought benefits not only to fish stocks but also increased economic returns.

The feature of this method was that the choice of the larger mesh size was made by fishermen's initiatives. Before the larger mesh sizes were introduced, the common concept prevailing in the region was that whilst fishermen could in the future anticipate the advantages of larger-mesh sizes and consequent benefits, they thought it would take some time before they could get such benefits. The waiting period was the major concern of fishermen and they thought that it would lead to a decreased income. There was, thus, no motivation for fishermen to use larger mesh sizes. Nevertheless, some fishermen voluntarily experimented with the use of larger mesh sizes on the grounds that there was technical evidence that the use of larger meshes would enhance catching efficiency, and because of the use of small-sized meshes for many years, the survival rate of large sized fish increased and an increase of catches could be expected in any event.

Table 1 shows the result of bottom gillnet fishing operated by two fishermen using the different mesh sizes. Fisherman A (one-man boat) operated a net of 420 m with the mesh size of 10.3 cm while Fisherman B (3-men boat) operated a net of 840 m with the mesh size of 8.5 cm. It is evident from Table 1 that whilst B's catch was bigger 1.8 times (in quantity) and 1.4 times (in value) than A's because of the scale of production, catch per unit length of net was 99.9 kg for A and 85.8 kg for B and the unit value on average (kg) was higher for A than for B by 1.2 times. This is because the size of fish landed by A was bigger than that by B. This resulted in A's gross profit being twice as big as B's. Once the economic effects of using larger mesh sizes were revealed by the Prefectural Experimental Station in Fukushima Prefecture, all local vessels switched to use large sized meshes which ranged 11.5-12.1 cm.

### 4. Enhancement of fish stocks

Fish farming can contribute to the enhancement of fish stocks. At present, seeds of both finfish and crustaceans are produced and released into the sea on a commercial scale. The most popular species used for fish farming are Kuruma prawn, blue crab, flounder and red snapper. Kuruma prawn farming particularly has been carried out in Japan during the last 25 years.

The Iwami Fisheries Cooperative in Hyogo Prefecture has been involved in fish farming of Kuruma prawn since 1971 and now also deals with blue crab and flounder (FI:CCFM/92/Exp.4). Although the project was initiated by a group of fishermen of the above Cooperative, alarmed by the deterioration of fishing grounds, there has been a period of crisis because of the lack of interest and cooperation on the part of some fishermen.

Kuruma prawn farming started with a subsidy granted by the Municipal Office, Prefectural Government and other organizations concerned. Fishermen also contributed to the capital required for the project in the form of levies imposed on them. Effects of the project began to appear immediately after it started. The catches increased in proportion to the quantity of fry released. Regulatory measures were implemented to sustain the fishery, including: (i) Kuruma prawn to be caught only by masu-ami (a small set-net) - previously gillnets were used; (ii) the body length of prawn caught should be more than 10 cm; (iii) the mesh size of the bag net of masu-ami, to which prawn was finally trapped, should be more than 21.6 mm; and (iv) the offshore side of the set-net should be set in waters whose depth was more than 8 meters.

In the early stage of development, neither the Cooperative nor fishermen properly observed the regulations, though production was on an upward trend. Therefore, the prefectural fisheries experimental station, which produced the seeds and distributed them to fishermen for release in the sea, suspended this distribution in 1978 with the intention of proving the effect of the project and the need to observe regulations. The catch of prawn in 1978 dropped sharply. This persuaded fishermen to collaborate with the Government and generated an awareness of the importance of resource conservation. At present, Kuruma prawn farming is administered by the Iwami City Development Council comprising the Municipal Office, Town Office, Iwami Fishery Cooperative and private companies. The major functions of the Council are to establish measures to overcome problems concerning water pollution and production plans of seeds and marketing of harvests, including the enforcement of management measures. Coordination with other fisheries (over 30 different types of fishing are operated in the area) is also a very important activity of the Council.

### C. Aquaculture management

The main purposes of aquaculture management are: (i) to maintain and preserve the quality of aquaculture farms and environments; (ii) to determine an appropriate quantity of stockings based on the assessment of the capacity of aquaculture grounds. Excessive stocking is likely to cause the deterioration of culture farms leading to outbreaks of fish diseases, degradation of quality of products, destruction of seeds and the outbreak of red tides.

These objectives can be better achieved through the establishment of a collective management system where the selection of species, purchase of seeds, feed for fish, equipment and marketing of the harvest are collectively dealt with by fish farmers. In this respect, aquaculture management may be regarded as synonymous with business management. In Japan aquaculture is incorporated within the legal and institutional framework of fishery management and it is operated in demarcated areas which are free from encroachment of other fishing activities including tourist fishing.

TABLE 1

Costs and benefits by bottom gillnet with different mesh sizes

	A	B
No. of fishing days	161	166
No. of fishermen involved	1	3
Catch (kg)	6 757	11 959
Value of catches (1000 Y)	7 210	10 280
Average value (Yen/kg)	1 068	859
Direct expenditure (1000 Y)	2 270	2 810
Gross profit	4 940	7 470
<u>Per unit length of net</u>		
Catch (Yen)	1 280	884
Direct expenditure (Yen)	884	241
Gross profit (Yen)	877	643
<u>Per kg of fish</u>		
Direct expenditure (Yen)	336	235
Gross profit (Yen)	732	624
<u>Per fisherman</u>		
Catch (Yen)	721	332
Direct expenditure	227	90
Gross profit	494	242
Length of nets used per one operation (m)	35	840
Total length of net used (km)	67.2	139.44
Catch per unit length of net used (kg/km)	99.9	85.8

Effective utilization of fish stocks exploited by bottom trawlers fishing resources

Source: Hajime Yoshida, Fukushima Prefectural Fisheries Experimental Station, 1985

As with reef fisheries and inshore fisheries, the chief objective of aquaculture management is to achieve the maximum economic benefits. To attain this aim, a variety of approaches have been taken which differ considerably according to the species to be cultured and local socio-economic conditions.

One of the methods commonly undertaken is to level off the scale of production among participating fish farmers. A suitable example can be seen in yellow tail culture performed in Nagasaki Prefecture (FI:CCFM/92/Exp11).

The Kobe Fishery Cooperative has a total membership of 282 with the landings of 1,800-2,100 tons in quantity and Yen 1.5-1.9 billion in value. In the past, purse seines were the main gears used by members of the Cooperative but this fishery suffered from poor catches with low incomes. Purse seines owners, therefore, converted to yellow-tail cage culture early in 1970. As of 1985, there were 28 cage net operators.

#### Methods

- (a) The Prefectural fisheries experimental station provided extension support to examine the quality of culture farms in respect of water temperature, specific gravity, transparency, heavy metal contamination, etc.
- (b) Fry of yellow-tail were caught from natural habitats and restrictions were imposed on the quantity of fry to be caught, the season and the number of boats used.
- (c) There were strict restrictions on the aquaculture installations, for example: the size of cage nets (round shape) was restricted to less than 5% of the total area permitted for aquaculture with the stocking rate of 70 kg/m<sup>3</sup>; the size of cage nets (square shape) was to be, instead, less than 10% with the stocking rate of 35 kg/m<sup>3</sup>. In addition, detailed instructions were given by the prefectural government as to the deployment of rafts, fallow, collective purchase of food, purification apparatus, etc.
- (d) A Committee was set up within Kanbe Fisheries Cooperative with the membership of 8 area representatives. The functions of the Committee was to plan and arrange the harvesting of fry, distribution of fry, inspection of the use of rafts/cages, examination of the quality of culture farms, fish disease control, etc.
- (e) The basic policy of aquaculture management was to level off the scale of production among cage culturists. As compared with the initial stage of development, the gaps between the largest and smallest farmers became narrow, with the difference in production of about 5,000 fish in 1985.
- (f) Collective marketing of the harvest was undertaken by the Cooperative. This was essential to achieve the aim of aquaculture management. Had fish farmers sold their harvest and purchase fry and feed individually, then

it would have become almost impossible to regulate the quantity of fish to be cultured.

- (g) The Cooperative undertook collective purchase of feed and provided loans to purchase equipment, food, medicines, drugs and chemicals to prevent diseases, etc.

#### Effects

- (a) No degradation of environmental conditions in aquaculture farms has been experienced. No red tides have ever occurred in the region.
- (b) Turnover has been stable for many years and the business has been financially stable.
- (c) Levelling off the scale of production has contributed to eliminating the sense of inequity in respect of the use of culture farms. This was instrumental in increasing awareness of the benefits of cooperation among fish farmers.

#### CONCLUSION

Coastal fisheries management has significantly contributed to the economic growth of fishing villages in Japan and has allowed resource rents to be captured by fishermen's groups. The behaviour of Japanese fishermen is characterized by collective action. It's merit is to reduce conflicts among fishermen from a social point of view, while it also strengthens bargaining positions of fishermen from the economic point of view. This has been possible because of the century-old common property ownership of rural fishing communities over coastal resources, and also the homogeneity of the Japanese society which removes barriers otherwise blocking concerted efforts in collective action.

These factors have made it easier for public entities and community organizations to establish biological and economic regulatory measures for the inshore fisheries. Despite varied socio-economic and topographical conditions throughout coastal villages, elements that have contributed to successful operation of the coastal fishery management include:

1. availability of scientific data on the state of fish stocks;
2. close collaboration between research institutes and fishermen whereby the former disseminate research results to fishermen while the latter offer their services to provide data and mobilize fishing vessels for survey purposes;
3. strong participation of fishermen individually and as groups in inshore resource management based on the awareness of the tangible economic benefits they acquire from regulatory measures through democratic decision-making processes;

4. fishermen's strong perception of the economic advantages gained through collective action over other economic groups;
5. important roles of fisheries cooperatives in promoting people's participation and driving group initiatives;
6. adoption of integrated approaches in fishery management entailing stock enhancement and other biological resource management measures as well as establishment of disciplines in fishing grounds, production and marketing control.

There is evidence, however, that the system has to keep adjusting dynamically to socio-economic changes in the villages and in the country, changing conditions of the coastal stocks, technological innovation and market demands. These adjustments could be facilitated by strengthened collaboration among government, research institutes, fishermen and private sector.



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## COASTAL RESOURCES MANAGEMENT IN PANGUIL BAY, PHILIPPINES

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### ABSTRACT

Panguil Bay in NW Mindanao is one of the most ecologically favoured fishing grounds in the southern Philippines. There has been a very rapid growth in the populations of the fishing villages around its coastline and a big increase in the number of fishing craft. Total catches and yields per unit of effort have, however, drastically declined. At the same time, the important mangrove nursery grounds have suffered serious degradation and other pollution and environmental problems have also increased. The Bay has thus been made a priority area for coastal resources management under the Department of Agriculture's Fisheries Sector Programme. An integrated management plan has been formulated and is now in the process of implementation. Both the preparation and execution of these plans depends heavily upon the support and participation of fishermen's associations and communities, in consultation and collaboration with government agencies, NGO's and academic institutions. The paper describes the approaches taken in planning and implementing the management programme, the key issues identified and strategies adopted, including the establishment of fish sanctuaries, artificial reefs, territorial use rights zones and strengthened self-regulation and enforcement. Great emphasis is placed upon the role of training, public information and education and self development activities.

### A. INTRODUCTION

#### 1. Physical Setting

The ecological peculiarity of Panguil Bay has made it one of the most important shallow water fishing grounds in all of Mindanao in the Southern Philippines. Forty seven rivers and tributaries flow into the bay, and because of its tooth-like shape, the salinity gradient varies transversely from 33 parts per thousand at its mouth where the waters open up to the larger Iligan bay to almost 0 ppt at its innermost reaches in the swampland of Zamboanga del Sur province. There is an apparent strong horizontal surface water circulation effected by wave action over the narrow body of water which in turn make the

bay a natural spawning ground for many species of penaeid shrimps and species of fish migrating to brackishwater during their reproductive seasons.

The bay is approximately 18 405 ha, with a coastline spanning 116 km from end to end and covering part of the coastlines of three provinces. It is an important trading link between these provinces and, indirectly, the combined coastal population of 451 362 people is affected by the stability of the coastal environment.

The bay is source of some of the most valuable species of shrimps and crustaceans in the region. Its reputation for being the source of fecund, superior quality *Penaeus monodon* spawners is widespread and, indeed, the bay has supported the viability of many prawn hatcheries throughout the region. There is a thriving export business for first class mud crabs of the species *Scylla serrata* and, most recently, this has spawned a backyard industry for crab fattening. The rivers and tributaries of the inner bay are known to host a mature population of the giant freshwater prawn, *Macrobrachium rosenbergii*, as well as mullets, eels and spadefish.

All in all, the bay supports a fishery consisting of 106 species. In addition, there are two species of commercially important mollusks (*Modiolus metcalfei* and *M. elongatus*) and at least three species of seaweeds that provide alternative sources of income to fishermen.

## 2. Resource Issues

Beyond this seemingly copious resource profile is a situation of wanton resources and environmental degradation made even more complicated by widespread poverty among municipal fishermen and widespread attitude among the users, of disregard for sustainable management of resources.

The decline of resource base is clearly indicated in the numerous resource assessments and ecological investigations so far conducted in the area by the Mindanao State University. A three-year study on catch rates from 1982 to 1984 concluded that catch per unit of fishing effort for four fishing gears were significantly decreasing (Table III). Annual catch rates for motorized scissor net (not then banned) declined by 12% lift net by 69%, bottom set gill net by 59% and fish coral by 26% during the period under study. A present, the average catch per fisherman per day is only 1.77 kg. or only about \$ 2.49 at current local prices. In contrast, the number of fishing craft increased, from 2 033 in 1984 to 5 609 in 1991.

The mangrove resources have been subjected to an equally critical degree of degradation. Based on interpretation of satellite pictures of the bay, the mangrove forests have been reduced to 3 623 hectares or only 29% of the estimated mangrove cover of 12 590 existing in 1950. The denudation of the mangroves has been attributed to the development of fishponds which now cover 5 069 has. and clearing activities for human settlements over an area covering 3 989 has.

The importance of the mangrove ecosystem to the productivity of the bay and to its characteristic as a favoured nursery ground cannot be over-emphasized. Juvenile crabs,

groupers and black tiger prawn fry constitute a major source of livelihood for the bay's inhabitants.

But the mangroves are not the only key ecosystems that are presently threatened. The coral reefs in four groups of shoals in the mouth of the bay have been totally subjected to blast fishing. Elsewhere, siltation from the uplands are slowly altering fragile habitats; deforestation in critical watersheds remain unaddressed and the residues of the vast aquaculture estates in the inner wetlands as well as pesticide residues from rice farmlands are being poured into the bay without regard for their long-term effects on the quality of the bay's waters.

On the other hand, persistent violations of fishery laws are commonplace. From 1990 to 1991, the law enforcement task force of the Panguil Bay Development Council confiscated or destroyed some 1 600 filter nets, apprehended more than 60 violators, seized some 30 scissor nets and uprooted more than 200 net posts in the bay. Despite these efforts, fishermen continue to circumvent the laws; they have designed gears that may not be technically classified as the outlawed filter net but in fact functions identically. The popular fish corals, a legitimate gear in the Philippines, have been modified to include double netting of legal mesh size but which stretch to almost nil when oriented towards the current, in the process straining everything but the water. Occasionally some dynamite fishermen still manage to elude the daily patrols conducted by three provincial military commands and three groups of fishery officers from the Department of Agriculture.

## II. The Fisheries Sector in Panguil Bay

### A. The Program Components

In the light of this crucial situation, Panguil Bay has been made a priority area for the implementation of coastal resources management under the Fisheries Sector Program (FSP) of the Department of Agriculture.

The FSP is a US\$ 150 million program, supported by the Asian Development Bank and the Overseas Cooperation Fund of Japan, designed to address the degradation of coastal environments and resources and, in particular, the declines in fish catch from many nearshore areas of the country. The FSP has six components which are complimentary and partly overlapping fishery resource and ecological assessments; coastal resources management in twelve priority bays; law enforcement; research and extension; credits to promote alternative livelihoods; and fisheries related infrastructure improvement.

The Coastal Resources Management (CRM) component, which is integrated and multi-sectoral, is the core of the FSP and has implications for most of the components in the program. It is the manifestation of all efforts in the actual management of coastal resources in the 12 priority bay sites but focused initially in three pilot bays, including Panguil Bay, as shown in Figure III. The CRM component is principally focused on the formulation of management plans through a site-specific planning process and the implementation of these plans through the participation of local governments, non-government organizations and fishermen associations. The draft CRM plans are generated through a series of consultative

workshops and training courses involving the participation of the local government, NGOs, the communities and fishermen associations in the bay area with guidance from the Program Management Office of the FSP and the Bureau of Fisheries and Aquatic Resources. CRM planning entails resource, ecological, socioeconomic, cultural, legal and institutional assessments for management. Strategies for the implementation of CRM plans typically involve the use of community-based resource management schemes. These include the declaration and management of marine reserves, parks or fish sanctuaries, municipal or bay wide zonation schemes based on use rights for particular resources and areas, establishment and management of artificial reefs, law enforcement at the village level, localized education programs, facilitation of alternative livelihood projects other than capture fisheries and establishment of bay-wide management councils. It is important to note that the design and adoption of appropriate CRM strategies depends upon the participation of communities involved in the formulation of the CRM plan. The FSP catalyses the decision making process at the local level and provides them with adequate technical and logistical support in order that their activities may dovetail to the overall direction of the program. In this context, the FSP participates in the resolution of the community's perceived needs rather than the other way around where the fishermen are being encouraged to participate in a government project.

The fishery resource and ecological assessment component (REA) provides the rationale for the CRM measures to be implemented. These studies will form part of the national fisheries information systems which will continually monitor fish stocks, habitats, ecological parameters and socio-economic indicators. Initially, the data generated from the REA of the bays will provide the scientific data base upon which management decisions such as the establishment of MSY levels for fishing zones or the imposition of closed or open seasons can be made.

The law enforcement component focuses on the training of local enforcement personnel and selected government and community members in the implementation of national and municipal laws affecting resources management. Much of the effort will be through community-based groups so that they will be directly involved in policing their own members and exercising peer pressure.

The research and extension component supports CRM in facilitating special research studies that address critical, area-specific constraints to sustainable resource management. It is also through this component that extension services on sea ranching, mariculture and other technological innovations are rendered. Studies on economic rent, red tide, tuna and cephalopod exploratory fishing are likewise being conducted through this component.

The credit program is intended to stimulate the participation of fisherfolk in alternative livelihood activities which will draw them away from capture fisheries and limit their dependence on coastal resources. It is supporting of projects within CRM plans for each bay and the diversification and improvement of aquaculture.

The infrastructure component addresses the need for improved fishery marketing and storage facilities.

## **B. FSP IMPLEMENTATION AND APPROACH**

A Program Management Office (PMO) is responsible for the management and implementation of the FSP. At the regional level, a special assistant for fisheries development has been appointed under the regional director of the Department of Aquaculture to work on FSP matters, particularly in coordination and monitoring of program implementation and administrative work at the local level. Province fisheries management units (PFMU) within each province of each bay have also been assigned to assist in the formulation and implementation of the CRM plans. The PMO is responsible for providing overall guidance and policy directions, as well as in monitoring and evaluation of all components.

The Fisheries Sector Programme is based on the philosophy of promoting regional and local responsibilities in coastal resources management. It is attempting to decentralize fisheries management to municipalities and fishing communities while maintaining a sound base of research and assessment upon which to base decisions for sustainable use. Economic rent studies are suggesting how to use shoreline land to ways which are justified and equitable. License fees for commercial fishing will assist in limiting fishing effort while improved law enforcement and the promulgation of municipal ordinances on fisheries will also help to manage fishing effort at the local within sustainable limits.

Integrated CRM at the bay level will require a network of institutional linkages and inter-agency coordination. Such management structure will evolve from the bay management council which is an organization of delegates from all sectors in the bay charged principally with resolving resource-use conflicts and coming up with decisions concerning resources management after ample consultation from the sectors concerned.

## **C. CRM IMPLEMENTATION IN PANGUIL BAY**

### **1. The CRM Plan and Development Process**

The concept of resources management and fishing effort regulation is not new in Panguil Bay as the Panguil Bay Development Council had been making considerable efforts to this even before the FSP was implemented in 1990. The Council, however, works randomly at issues as they crop up and sustainable use was never given sufficient emphasis. Rather, the council performed much as a law enforcement body.

Thus the FSP started the CRM process in Panguil Bay by consolidating all available data on the resources of the bay and the various issues affecting sustainability. This information, together with primary data gathered from a rapid resource assessment conducted by the Mindanao State University, was documented in an Environmental Profile of the Banguil Bay Coastal Zone. This document serves as the scientific databank which will continually be upgraded to contain new and more comprehensive information concerning the state of the resources from which to base policy decisions. The environmental profile is currently being updated through the conduct of detailed resource and ecological assessments over a span of 16 months by the Mindanao State University. These assessments comprised

of 14 studies covering finfish, crustaceans, mollusc, water quality, macro fauna, and pollution studies.

At the same time, the CRM process was started through the conduct of four seminar workshops involving more than 300 participants representing the various sectors involved in resource use and management in the bay. The outputs from these workshops were used to formulate the draft CRM plan for Panguil. These included the identified resource-related issues and problems that needs to be addressed, bay-wide policy recommendations for resource management and utilization, the proposed strategies for immediate implementation, and pilot projects for community-based initiatives.

The fundamental goal of the Integrated Management Plan for the Coastal Resources of Panguil Bay is the regeneration of the bay's fishery resources, their continued protection, and the maintenance of an economic level of productivity through the adoption of sustainable-use practices and reduction of fishing effort through the provision of alternative sources of income.

The CRM Plan presents a fairly comprehensive assessment of the cause of resource degradation in the bay and, despite the generality of the policies and strategies considered, the plan is able to spell out some very practical management options that address the more pressing issues. However, what has been more significant at this early stage of the process is that, despite the diversity of interests among those who contributed to the formulation of the plan, there is a clear consensus about what is causing resource depletion and how these can be corrected. This receptiveness to CRM presents profound implications for Plan implementation which are discussed later.

Among the fundamental management issues identified in the plan include the following:

- (a) coastal forest depletion and the destruction of breeding and nursery areas;
- (b) coastal land use conflicts;
- (c) declining returns from fisheries;
- (d) water quality degradation, particularly because of siltation;
- (e) poverty among the local fishing communities;
- (f) poor local participation in resources management.

After two refinements, the Plan was "promoted" to the concerned people in the bay. This comprised of orientation seminars for local government officials, NGOs, and government agencies whose involvement in plan implementation was deemed significant. In order to encourage support for the CRM concept, a general public information campaign was conducted through seminars and school teach-in sessions. During the monthly conference of the Panguil Bay Development Council on August 1991, the plan was officially adopted as

the policy document of the Council. The Plan is still being "sold" to the various communities in a continuing public awareness campaign. Most recently, the information campaigns included the distribution of brochures, pamphlets, posters, pencils and other educational materials, campaign buttons, comics and radio announcements.

Information dissemination has not been easy, particularly in the fishing communities where the typical fisherman has had only an average of four years of elementary education. There is a clear necessity for the translation of the plan and the CRM concept first into a level where it will be clearly understood even by the most lowly fisherman and second, into the local vernacular. Also, public information should not be confined to seminars and conventional meetings where fishermen and the general public are reduced to mere inert participants. The CRM Plan must be accepted as their own tool to help them carry out their perceived notions as to how to address sustainability of the coastal zone.

## **2. CRM Strategies and Projects**

A string of projects designed to execute key CRM strategies in the plan are already in the implementation stage in all three provinces in the bay. These include:

### **2.1 Establishment of fish sanctuaries and marine reserves**

The bay, as mentioned earlier, is a breeding and nursery area for many crustaceans and finfish both of the anadromous and catadromous species. In order that this vital biological function can take place unhampered and ensure that recruitment can be protected in some very essential habitats, at least three core sanctuaries representing distinctive salinity gradients and ecosystems in the bay have been established. The Tambulig Fish Sanctuary in Zamboanga del sur province is an 80-hectare estuarine area between two large river systems characterized by almost 0 salinity for most times of the year. It is a traditional source for berried mud crabs, giant freshwater prawn, large mullet and shrimps, among others.

The 93.5 hectare Loculan Shoal Fish Sanctuary and Marine Reserve is located at the highly slain mouth of the bay in the jurisdiction of the province of Misamis Occidental. It is composed of one big shoal with 60% fair coral cover and several smaller reefs, albeit badly damaged from years of dynamite fishing.

The third sanctuary is located in the municipality of Kolambugan, Lanao del Norte on the western side of the bay. The sanctuary is characterized by dense mangrove growth, seagrass systems and brackishwater. It is a known breeding ground for various species of shrimps and as a nursery ground for fry of the tiger prawn *P. monodon*.

These sanctuaries have evolved over a lengthy period of discussions with the communities near the areas. In fact, the size of the third sanctuary has yet to be adjusted as several small clusters of fishermen within the sanctuary area have expressed concern that the sanctuary covers what has been a traditional area for their fish corral operations. In this situation, these arguments regarding the establishment of the fish sanctuaries and the ensuing community dialogues are worthwhile. Once the disputes have been resolved and the merits understood as in the case of Tambulig and Loculan, the fishermen themselves positively



produce their establishment and protection. This fact is clearly illustrated in the management plans formulated for each sanctuary and the fishermen's associations are primarily responsible for the conduct of sanctuary patrols and law enforcement activities.

The two sanctuaries above mentioned are supported by Fisheries Administrative Orders.

## 2.2 Artificial reefs establishment and management

A total of three artificial reef sites will be established in suitable areas in the mouth of the bay. One site is composed of four complexes where each complex is made up of ten concrete cylindrical modules. Each module is composed of 30 concrete units positioned either vertically or horizontally to form a pyramid. One complex is therefore made up of 300 concrete tubes covering an area of approximately one hectare. The distance between complexes is 200 m while the distance between modules is 5 m.

Another artificial net site is made of used tires which will provide a good basis for comparative evaluation between the two types. Management plans for the sites have been formulated with the cooperation of fishermen's associations who have been engaged by the PFMUs in the fabrication, protection and maintenance of the reefs. These associations will have priority fishing rights over designated "fishing reefs" employing only certain selective fishing gears. At least one of the sites will be open to fishing; the rest will function as sanctuaries. It has been agreed upon that the fishermen's associations will declare the amount of fish catches over the sites so that stock monitoring can be undertaken.

## 2.3 Bay Zonation Plan

The beginning of territorial use rights in fisheries have evolved in Panguil Bay with the drafting of a baywide zonation scheme delineating municipal territorial waters and within these, the different zones for specific fishing gears, fry collection zones, seaweed mariculture areas, mussel and oyster beds and sanctuary and artificial reef sites. There is much still to be desired in this zonation plan as it had been formulated based on secondary data and traditional fishing practices. The most significant element, however, is that the concept of TURF has been introduced and again there seems to be a consensus among the twelve municipalities in the bay that zonification and the assignment of use rights and responsibilities to the local communities is an effective method of managing the bay's fisheries towards sustainability. This initial zonation plan is to be refined to incorporate more scientific bases after the resource and ecological studies being undertaken in the bay are completed at the end of 1992.

The zonation plan has been formulated and is being implemented through the coordinative work of the bay management council. The respective municipal zonation plans have been formulated by the different local governments based not technical assistance from the DA's fishery personnel and the local engineering office for map preparation. The order to adopt zonation as a preliminary means to restrict fishing effort and confine certain gears where they can be efficiently regulated and monitored came from the Council which used the

CRM plan as a basis. The Council itself reviewed the zonation plans, undertook its consolidation and proceeded to declare its official adoption by requesting the local mayors to incorporate the zonation scheme in their respective municipal ordinances. However, management plans for specific zones are yet to be formulated. Moreover, the local governments have yet to come up with the exact system for relocation of gears and more importantly how to regulate entry into the zones. However, the stage has been prepared for this significant change in fishery management.

#### 2.4 Fishery Law Enforcement

Law enforcement must be a pillar of fisheries management in the country in the light of widespread use of dynamite, fine mesh nets and poison in capturing fish. Centralized efforts in law enforcement have proved to be ineffective, however, as the long coastline and scattered villages is evidently unmanageable. Decentralization of law enforcement responsibilities along with the management of the resources thus became the focus of the Fishery Sector Programme. Nonetheless, law enforcement in Panguil Bay has been one of the most consistent functions of the Bay Task Force under the Council. The three provinces pooled their enforcement capabilities in one composite team of military and fishery wardens which undertake daily patrols using at least three patrol boats and a network of communication facilities that link those who patrol the seas with land-based units of fish examiners and judicial officers. The programme thus proceeded to boost the Task Force's capabilities further through the provision of more fast crafts, radios and more importantly, access to legal support and public education on fishery laws.

The FSP likewise initiated law enforcement training for the multisectoral members of the Provincial Committee on Anti-Illegal Fishing. Todate, more than 300 persons have been deputized as fishery wardens.

#### 2.5 Mangrove reforestation

The CRM Plan for Panguil Bay defines the bay's coastal zone as all areas where mangrove forests previously grew. This area extended to more than 8 000 ha excluding the sea itself. At present the area covered by the plan is characterized by various land uses. The fact remains, however, that the mangrove ecosystem is perhaps the segment of the coastal zone that needs the greatest rehabilitation and management. To this end, the plan spells out strategies for the zonation scheme will be difficult. It is accepted, however, that the local people should be the first group to benefit from these policies as long as the 3 basic goals of sustainable management are met. Allowing benefits to accrue to the local people is important as they who are the most likely to be affected by the policies apart from the fact that it is also the local populace who can make the very same policies effective.

Mangrove reforestation in Panguil Bay is being spearheaded by the Department of Environment and Nutrition Resources out of FSP counterpart funds. Some 587 ha of open mudflats are currently being reforested through community-based contracts. The FSP mangrove component is designed to directly involve communities in the management of the mangrove communities, either existing old growths or the reforested areas. This will be achieved through human development and community participation and by making access to

natural resources more equitable. Security of tenure over mangrove areas will be facilitated through the issuance of mangrove stewardship contracts. The certificate of stewardship contract is an agreement between the state as grantor and an individual Filipino as grantee whereby the former grants to the latter rights to peacefully possess and cultivate a tract of state-owned land over the long term and enjoy the benefits thereof. The aim is to motivate and organize the communities to become effective managers of their resources and at the same time lessen the endemic poverty by providing tenure rights holders with extra income from mangrove products, apiculture, mussel and oyster farming, seaweed farming or the use of simple fish attracting devices.

The principal mobilizing agents for this approach will be the NGOs through their community development workers who will be trained to implement community-based mangrove plantation management. Their role in organizing the communities is considered critical to the long term sustainability of the programme as the NGOs will be the primary catalyst for the decision making process at the local level and will function as the principal link between the communities and the implementing agencies at the provincial, regional and national levels.

## 2.6 Community organization

Community organization and education is the backbone of coastal resources management as it is through this activity that the transformation of the fisherfolk from mere resource users to conscientious resource managers will be carried out. With 76 coastal fishing villages and a fishermen population of more than 7 000, community organizing work is perhaps the most massive CRM activity currently being undertaken in Paguil Bay. This component sets the stage for the adoption of sustainable use practices in fisheries and prepares the fishermen for alternative livelihood projects.

NETWORK Foundation, Inc., a non-government organization based in the region, was contracted by the PMO to undertake community organizing in the bay. Their work programme extends over 3 years covering organizing and training on CRM, federation of fishermen's associations and entrepreneurial development.

## III. Institutional arrangements

Given the magnitude and scope of CRM in the bay, the task of ensuring that integrated efforts of participating institutions are fine tuned to a common direction becomes an enormous responsibility.

Coordination at the bay level, between local governments and the fishermen and between provincial and national government agencies and non government organizations working in the area will be undertaken by the Bay Management Council in order to ensure coherency and consistency of activities (Figure IV). The council functions as a coordinative and policy-making body but it does not, however, possess sufficient power to implement projects of handle financial matters. The Council is a loose coalition of sectoral delegates from almost all government agencies, NGOs and the local government officials of the three provinces within the bay's coastline. It is chaired by the governor of Lanao del Norte

province for a period of 3 years after which the chairmanship is revolved to the next governor of another province.

The Council functions as a forum for deliberations concerning resource issues. Its forte, however, has traditionally been the strict enforcement of fishery laws. The method it employs for the resolution of the issues presented during its regular monthly meetings is to subject the issue to extensive debates concerning the problems. Deliberations become even more lengthy in as much as the same issues are also discussed in the Panguil Bay Task Force, the technical arm of the council, which also holds its monthly meeting a week before the Council's schedule. With both bodies having an average membership attendance of about 100 at any one time, the resolution of an issue becomes a protracted process specially in the light of the Council's inadequate capabilities to conduct more scientific and technical evaluation of the issues at hand.

Nonetheless, the Council has had a good record in issuing resolutions and directives to all the local government units concerned that impose management regulations. Although at times some resolutions are mere requests for other institutions to do some work that should otherwise be the duty of the local citizenry, what is more important is that these institutions, as well as the rest of the government and non-government organizations in the bay, abide by the Council's orders. The key lies in the strong political will of the Chairman and officers of the Council.

The national government agencies participating in the CRM of Panguil are represented by bay coordinators who provide the central agencies with appropriate monitoring feedbacks concerning CRM implementation. The PMO of the FSP, on the other hand, has implemented a programme benefit monitoring system through the provincial fishery management units.

#### IV. Analyses of the CRM Process in Panguil Bay

Developing management options that reflect the local communities' perception of sustainable resource utilization is an important aspect of coastal resources management. This requires sound socio-economic and ecological information on which the most suitable decisions can be based. The communities, however, must be part of the decision making process in order that a sense of responsibility is encouraged when implementing the decisions. The CRM Plan for Panguil Bay already identifies many of the issues that need to be addressed and the policies, strategies and guidelines for a streamlined and coherent CRM programme. The commitment to translate this plan into real, tangible actions now rests with the local leaders and the DA provincial units.

Given this consideration, the CRM process in Panguil Bay hinges on a number of vital inputs.

First, the resource and ecological assessment of the bay must be completed at the earliest possible time in order that it can be used as a basis for the formulation of options

concerning community-based coastal resources management. Thereafter, this databank must be continually upgraded in a process of periodic ecological assessments and water quality monitoring.

The resource assessment databank will be able to feed to the local government units and the bay council indication on maximum sustainable yields which can be used as the basis for new licensing schemes based on the principle of economic rent; resource distribution data which can be used as the basis for the finalization of a TURF plan and many other scientific data that should be used as the basis for management decisions concerning fishing effort reduction to economically and ecologically acceptable levels.

The real dilemma in this situation is the determination of who shall be retained in the fishery, who are to be taken out to assume other means of livelihood, and what are the criteria so that the process becomes equitable to all. It is noteworthy that about two-thirds of all the fishermen perceive that fishing effort, or the absolute number of fishermen in the bay, is excessive. This is further confirmed by the opinions of 45% of some 900 fishermen randomly interviewed who believed that reducing fishing in the bay would actually help them.

The question of acceptance of sustainability based on MSY is therefore no longer an intractable problem in the bay, however, the dissemination of resource information in a manner that the fishermen can readily understand needs to be undertaken very seriously.

In this regard, the Council, working hand in hand with the Mindanao State University, the Network Foundation and the Provincial Fishery Management Units of the Fisheries Sector Programme, must now formulate a comprehensive plan for the conduct of fishermen conventions where guidelines for reduction of fishing effort will be generated from the fishermen's suggestions themselves. Attendant Council policies on gear regulation, seasonal fisheries, and the protection of species in the reproductive stage must also be finalized. However, the Council must upgrade its membership in the Task Force to include a majority of fishermen representatives. Moreover, it must streamline its general membership and structure if it is to function more systematically. The set-up proposed in Figure V limits the number of Council members to a handful of individuals who are capable of deciding firmly based on their recommendations of the Task Force. The latter body, on the other hand, will increase its general membership to include representatives from all sectors in the bay but all such members must be part of at least one of numerous committees composing the task force. These committees will be the main segments within the council that work on the evaluation of all aspects of an issue. The Task Force in short, functions as a clearing house for all issues that is brought up for resolution; assigning specific angles of analyses to the different committees and, thereafter, deciding on the best management options to be recommended to the Council. The Council, then, has only to review the process discreetly and shortly thereafter, adopt a final decision.

Secondly, the issues in the bay must be addressed holistically and that the linkages between different ecosystems be recognized as a whole. The Council may very well enter into Memoranda of Agreement with the concerned resource management agencies for seemingly remote but nonetheless important programmes as watershed protection and

rehabilitation and the prevention of siltation. The courses of action should not be too ambitious as to be unimplementable but rather practical and easily absorbed for community implementation. The development and refining of community initiatives is the key factor. For instance, in one of the fishing villages recently organized by Network Foundation under the FSP, the fisherfolk families agreed to plant coastal vegetation for as long as the seedlings and mangrove propagules are provided to them. Apparently, community education on the merits or resources management plays a key role in institutionalizing CRM.

The process of educating the fisherfolk should be viewed as a means encouraging development by the people themselves. It renders legitimate the process whereby the fisherfolk identify their problems, articulate and discuss them among their peers, analyze the causes, come up with their own solutions and plan and organize the actions required.

This factor, therefore, must be the overall guiding principle in the formulation of CRM projects. Encouraging and ensuring participation by fisherfolk in the projects is the most efficient method of increasing the chances of success of coastal resources management.

Table I

Population of the Coastal Villages of Panguil Bay

Place	1980	1990	Percent increase per year
Region 10			
Misamis Occidental			
Bonifacio	20,861	34,000	6.30
Tangub City	40,401	64,948	6.09
Balatacan	933	1,709	8.32
Baybay Mantic	918	1,295	4.10
Baybay Migkanaway	1,150	1,558	3.55
Bocator	898	1,048	1.67
Lorenzo Tan	1,167	2,118	8.15
Maloro	809	1,178	4.56
Maquillao	1,143	2,302	10.14
Panalsalan	552	1,069	9.37
Pangabuan	2,107	3,541	6.81
San Apolinario	551	790	4.34
Silanga	581	957	6.47
Sumirap	2,003	1,087	(4.57)
Garang	799	1,481	8.54
Ozamiz City	77,832	95,241	2.24
Clarín	21,521	26,932	2.51
Region 12			
Lanao del Norte			
Maigo	12,556	14,544	1.58
Balagatasa	2,716	3,392	2.50
CM Recto	1,043	1,624	5.60
Labuay	1,245	2,140	7.20
Liangán West	888	898	0.11
Segapod	1,333	1,538	1.50
Kulasihan	359	388	1.00
Kolambugan	19,321	25,493	3.19
Tubod	24,740	32,740	3.20
Baroy	14,078	17,412	2.40
Baroy Dacu	936	1,292	3.80
Raw-an Point	607	1,508	15.00
Sagadan	1,024	1,367	3.30
Lala	35,115	42,478	2.09
Bucana Matampay	415	591	4.24
Bucana Daromawang	739	1,160	5.69
Camalan	249	443	7.79
Gumagamot	1,133	1,196	0.55
Pacita	832	1,216	4.61
Kapatagan	25,303	33,393	3.20
Margos	1,011	1,281	2.67
Taguitic	1,838	2,333	2.69
Lapinig	2,161	2,746	2.71
Region 9			
Zamboanga del Sur			
Aurora	41,922	48,606	1.59
Anonang	811	1,800	12.19
Lintugop	1,676	2,700	6.11
Balas	979	1,782	8.20
Gubaan	1,019	1,500	4.72
Tagolalo	502	1,080	11.51
Tambulig	17,740	27,914	5.74
Cabgen	423	1,354	22.00
Sumalig	1,394	2,129	5.27

Table II A-B

Total Provincial Population and Percentage Share of Panguil Bay Towns

Province	Total Land Area (Has)	Total Population	Population w/in Panguil Bay	%
Zamboanga Sur	805,200	1,183,845 (1980)	68,999	5.82%
Misamis Occ.	193,932	418,850 (1988)	201,851	48.19%
Lanao del Norte	231,630	573,720 (1988)	180,512	31.46%
Total		2,176,415	451,362	20.73%

Total Population by Municipality and by Coastal Barangays

Municipality/City	No. of Barangays	Total Population (1989)
Aurora	5	46,875
Tambulig	3	22,124
Total (Zamboanga del Sur)	8	68,999
Bonifacio	4	34,000
Tangub	14	45,678
Ozamiz	14	95,241
Clarin	4	26,932
Total (Misamis Occidental)	36	201,851
Tubod	3	35,000
Baroy	4	19,493
Kapatagan	3	35,860
Lala	5	50,122
Kolambugan	11	25,493
Maigo	6	14,544
Total (Lanao Norte)	32	180,512
Grand Total	76	451,362



Table III A-B

Estimated Catch and Effort of Four Selected Fishing Gears  
in Panguil Bay CY 1982

Gears used	Number of units	Catch/trip (kg)	No. of trip/ year	Annual catch (tons)
Motorized scissor net	12	2,452.06	252	29.42
Lift net	60	4,558.63	252	273.51
Bottom set gill net	300	862.57	252	258.77
Fish corral	683	1,370.72	300	936.20

Source: MSU

Estimated Catch and Effort of Four Selected Fishing Gear  
in Panguil Bay, CY 1984

Gears used	Number of units	Catch/trip (kg)	No. of trip/ year	Annual catch (tons)
Motorized scissor net	12	2,162.72	252	25.95
Lift net	60	1,425.87	252	85.55
Bottom set gill net	300	354.50	252	106.35
Fish corral	683	1,023.74	300	691.70

Source: MSU

Table IV-V

Perception of Respondents on Whether or Not Fishermen  
in Panguil Bay are Excessive

Municipality	% Perception			
	Excessive	Not Excessive	Don't Know	No Answer
1. Clarin	40	2	8	50
2. Ozamiz City	57	-	43	-
3. Tangub	46	6	48	-
4. Bonifacio	72	28	-	-
5. Tambulig	93	-	7	-
6. Aurora	66	15	19	-
7. Kapatagan	97	3	-	-
8. Lala	78	-	22	-
9. Baroy	93	-	7	-
10. Tubod	16	16	68	-
11. Kolambugan	73	8	19	-
12. Maigo	65	6	29	-

Perception of Respondents on Whether or Not Minimizing Fishing  
in Panguil Bay would Help Fisherfolks

Municipality	% Perception			
	Excessive	Not Excessive	Don't Know	No Answer
1. Clarin	40	3	18	39
2. Ozamiz City	34	14	52	-
3. Tangub	25	21	54	-
4. Bonifacio	33	28	39	-
5. Tambulig	56	35	9	-
6. Aurora	61	7	32	-
7. Kapatagan	72	14	14	-
8. Lala	17	17	66	-
9. Baroy	46	27	27	-
10. Tubod	52	24	24	-
11. Kolambugan	-	-	-	-
12. Maigo	65	21	14	-

Fig. I - Sketch Map of Panguil Bay

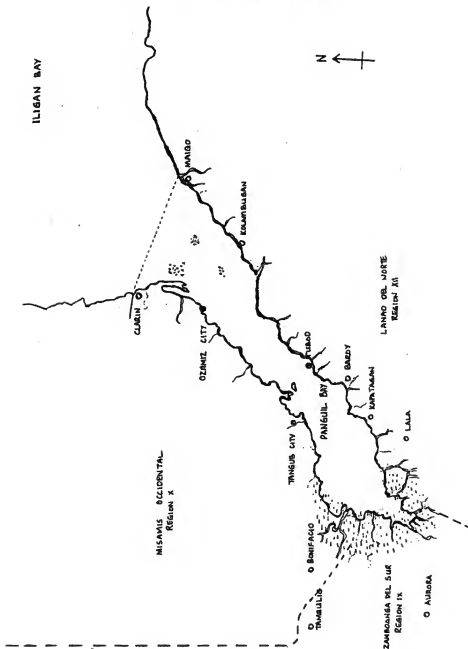


Fig. II

**FISHERIES SECTOR  
PROGRAM**

**PRIORITY BAYS FOR  
COASTAL RESOURCES  
MANAGEMENT COMPONENT**

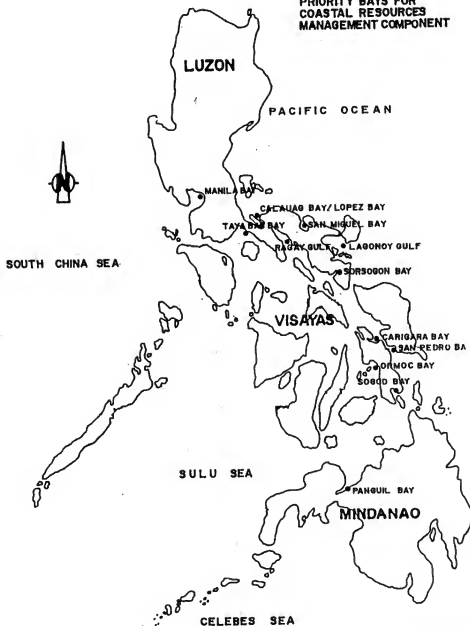


Fig. III - Location of Fish Sanctuaries and Artificial Reef Complexes in Panguil Bay

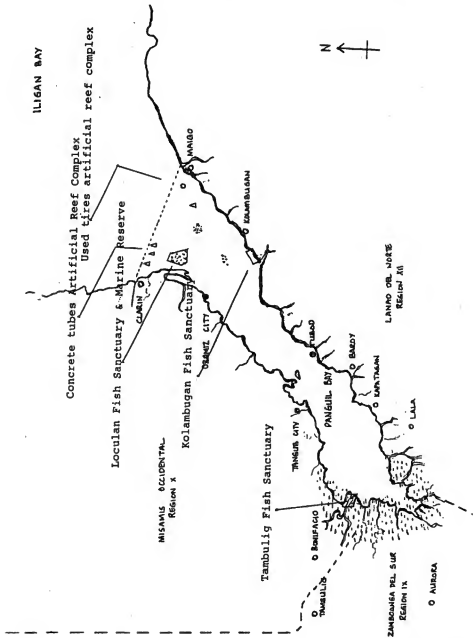


Fig. IV

*DIAGRAMATIC SKETCH OF CONCRETE  
ARTIFICIAL REEF*



Fig. V

DEPLOYMENT OF FOUR COMPLEX ON CONCRETE ARTIFICIAL REEF  
at SAN ROQUE CLARIN MIS. OCC.

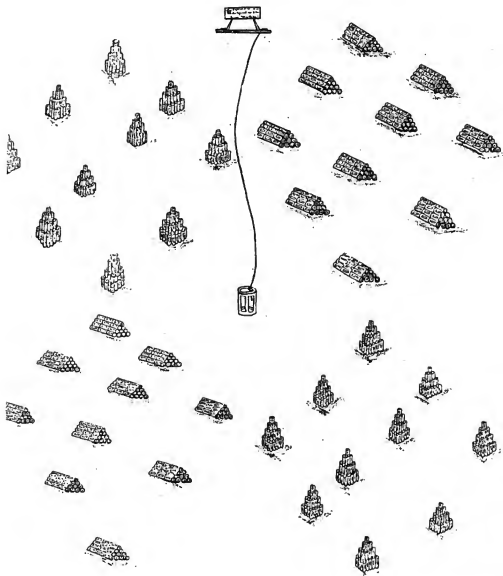


Fig. VI

Implementation of Major CRM Inputs in FSP Bay Areas

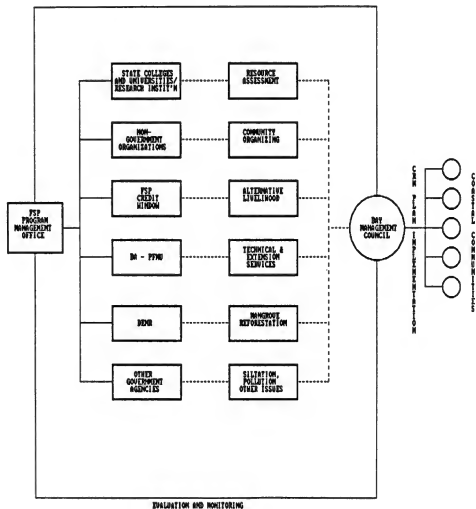
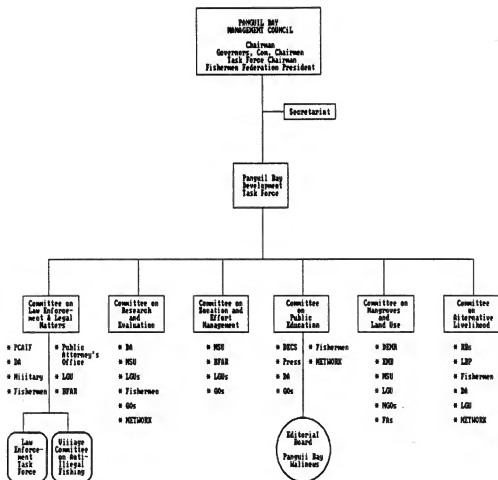




Fig. VII

Proposed Organizational Set-up of Pangul Bay Management Council



## COMMUNITY MANAGEMENT OF MARINE RESOURCES IN THE MALUKU ISLANDS<sup>2</sup>

by

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### I PREAMBLE

Although the language of the Indonesian Basic Fisheries Law No. 9/1985 frequently mentions the needs of Small-Scale Fishers, their customary rights and practices are not formally recognized or sufficiently developed to constitute a secure legal basis for protection, implementation, or litigation. Despite the existence of positive legislation protecting the inshore rights of small-scale fishers (SSFs) including the Trawler Ban and its implementing regulations, as well as other laws attempting to protect inshore SSFs from large scale capital enterprises, the rights of SSFs to control, manage, and benefit from their efforts in the inshore waters are not recognized, articulated and guaranteed in law.

The kinds of rights SSFs may hold, under the Basic Fisheries Law No. 9/1985 (BFL), are underdeveloped if one compares the status of customary law and the variety of rights which may be obtained through detailed procedures under the Basic Agrarian Law.

In the Basic Agrarian Law of 1960, particular chapters and articles recognize the kinds of customary rights (*hak adat*) and community territorial rights (*hak ulayat*) and procedures by which these rights may be obtained over land. In addition, the Basic Agrarian Law of 1960 recognizes, among others, ownership rights, enterprise rights and development rights. Although the Basic Fisheries Law has developed elaborate procedures for licenses for large scale enterprises, specific legal procedures for the establishment of a variety of community or individual possessory rights on the seas are not recognized or elaborated.

The social, economic, and environmental losses arising from this condition of open access in Indonesia's inshore territorial waters for small-scale fishing families are significant. The approximately 2-3 million small-scale fishing families are among the poorest of Indonesia's social groups, yet they provide about 60% of the animal protein consumed.

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<sup>2</sup> This paper is an edited version of a longer report prepared by Mr Zerner for the Fisheries Research and Development Project, based at the Central Fisheries Research Institute, Agency for Agricultural Development, Department of Agriculture, Indonesia. Research for this study was funded by the US Agency for International Development and support for preparation of this paper was provided by the Woodrow Wilson International Center for Scholars.

If the rights of SSFs are recognized, on a national and province-level basis, the enforcement of national fisheries law would also improve. There are many problems in effectively implementing and enforcing national and provincial fisheries laws. SSFs play a crucial role by reporting and monitoring fisheries violations. Legal recognition of SSFs rights to manage discrete and bounded sections of the inshore seas would increase SSFs' incentive to positively participate in monitoring and controlling unlawful activities on Indonesia's seas. Conversely, if the inshore seas are allowed to remain under a national open access regime, the incentive for SSFs to collaborate with fisheries officials and security organizations is weakened.

This report documents the rich variety of effective locally recognized forms of community regulation and management of the inshore marine sector known as *sasi*, in the Maluku islands. By documenting this rich variety of institutional arrangements, patterns of legal implementation, the diverse content of local regulations, it can be shown how certain local communities have invented, and continue to maintain, vital and valuable legal practices. These practices not only secure the rights of local people to continue to eat and earn a living from the inshore seas they manage. These practices - cultural inventions which continue to change and be modified - may be developed to help insure sustainable levels of stocks and to conserve the riches of Indonesia's marine biological diversity.

#### Community Management of Marine Resources

Community-based legal systems and management institutions can potentially alleviate many of the problems in fisheries administration and legal implementation touched on above. Local coastal communities provide a highly knowledgeable labour pool of observers who travel to sea daily. Secondly, these fishers are intensely motivated to observe and report any violations of fisheries laws, particularly laws which they have developed. Local fishers have a strong sense of entitlement to the waters they fish and will fight to preserve their rights if they believe they are threatened by unequitable or illegal practices. Because the continued existence of resident marine stocks at sustainable levels is essential for the survival of local fishing communities, as well as the continued availability of mobile stocks, these villagers are highly motivated to report and to prevent the occurrence of illegal, environmentally destructive or socially inequitable practices in their own areas.

Formal legal recognition of community-based rules, boundaries, rights, and institutions will potentially secure a stream of economic benefits to local communities and allow successful environmental management practices to be developed and refined. Where possible, existing systems of customary law and practices and community-wide areas of rights should be the armature for the continued development of management systems.

Community-based legal systems and institutions for fisheries management are no panacea: problems in national fisheries law and administration remain and must be worked out at the centre and the province level. Moreover, no assumptions about local communities being in harmony with the environment can be made. The concrete effects - environmental and socio-economic - of community legal rules, practices, and institutions are site and culture specific, and situated in history. The effects and development potential of each community's management rules and institutions must be assessed on a case by case basis.

## II COMMUNITY MANAGEMENT AND CUSTOMARY LAW AND LEGAL INSTITUTIONS IN THE MALUKU ISLANDS

Recent research in Maluku Tengah and Maluku Utara has revealed a variety of legal and institutional arrangements which promote effective micro-environmental management, economic distributive justice (fairness or equity), effective law enforcement, and secure economic benefits to the local community. Key features of these community designed and administered systems of customary law, known as *sasi*, are summarized in the following discussion.

Contemporary Moluccan marine customary law employs a great diversity of legal rules and social strategies to effectively manage the inshore marine environment for three ends: (1) to insure fair and equal opportunities of access among local community residents to the natural benefits of the inshore fishery; (2) to insure effective sustainable management of sedentary marine species within the waters of the community; and (3) to insure that the members of the community have the opportunity to continuously derive food and economic income from the marine species which temporarily visit or permanently inhabit their community waters.

### 1. Regulations

To attain these ends, local fishermen have devised a variety of regulations which affect: (1) timing of fishing seasons; (2) permitted and unpermitted gear; (3) permitted and prohibited fishing behaviours or techniques; (4) species specific or stock specific regulations; (5) place specific fishing seasons within the community waters; (6) boundary concepts and physical markers.

#### (a) Fishing seasons: Opening and Closing Seasonal Regulations

The most basic means by which access to and pressures upon marine stocks are regulated is through *sasi*. *Sasi* refers to practices which regulate when local inhabitants are permitted to harvest resources. When the *sasi* is open then local inhabitants may harvest particular resources. When *sasi* is closed, no one in the community may harvest resources in the area in question. All *sasi* systems assume that outsiders - those who live outside the community - have no rights to harvest in the area under *sasi* protection.

The word "*sasi*" means prohibition, as in a prohibition on the harvest of trochus shell (*T. niloticus*), known locally as *lola* or *bla' lola*'. To open the *sasi* means to declare an open season on trochus in the waters of the community. To "*tutup sasi lola*" means to close the harvest season on trochus, whether to community members or outsiders.

The reasons for the opening and closing of *sasi*, for example, in the marine sector are varied and may include: (a) degree of financial need of the specific community (if a season of religious rituals or marriages is forthcoming, a community may open the *sasi*); (b) the maturity and numbers of individuals of the kind of creature that is about to be harvested; (c) the weather: diving, for example, for sea cucumber, mother of pearl or trochus may be impossible during the rainy or windy season.

(b) Area under Regional Environmental Control of the Community

Many Moluccan coastal communities have a well defined sense of a community managed and controlled marine territory called a petuanan. The concept and concrete boundaries of a marine district is critical to the operations of community rules for environmental management because it provides a concept of an area as a legal entity - a district or jurisdiction within which community rules are applied - and a concrete, material boundary that permits enforcement and implementation of rules.

The most common term for this community-controlled area is petuanan which comes from the Indonesian tuan meaning owner, with associations of power, government, master and rule.

(c) Permanent Boundaries of the Petuanan

The boundaries between adjacent community petuanan are frequently natural features in the coastal landscape, especially promontories or points. Thus in Halmahera, Saparua, and Hatta islands, the outermost lateral extent of a community marine petuanan was recognized as the tip of two proximate points. On Halmahera, an imaginary line between these two promontories on opposite sides of a deep cove, about 15 kilometres deep and 40 kilometres wide, constituted the boundary of one well-administered petuanan.

In addition to the inshore, coastal coves, inlets, and sections of ocean claimed and regulated as community marine petuanan, several island communities claim use and control rights over submerged atolls and underwater reefs which may be several miles from the island on which the community is located. These "underwater islands" and the waters immediately surrounding them, as well as their reefs, resources, and living creatures, are considered part of the petuanan of many Moluccan marine communities. Sasi regulations are implemented on the underwater areas as well as on the island-proximate waters, and fishermen from other islands recognize and respect these claims as much as they obey the regulation of the inshore island-linked petuanan.

(d) Cultural Signing of the Petuanan Boundaries

Marine and terrestrial rituals, performed on a yearly basis make the lateral boundaries of a community's petuanan temporarily visible. As sasi ritual practitioners make a pilgrimage to sacred spots on the tips of points or marine promontories, they are simultaneously inscribing boundary lines on the marine landscape as they pay homage to the implacable spirits said to guard and witness (saksi) the sasi prohibitions. Ritual "trees" decorated to resemble a marine equivalent of a terrestrial coconut tree, moored to the outermost limits of the community petuanan, also serve as temporary guides to the seaward boundaries of the community petuanan.

When sasi is closed, elaborate rituals are performed. These ceremonies simultaneously sign or mark the areas which are placed under the "closed sasi regime", publicizing the closing of the harvest season on particular resources to the entire community, and calling forth the supernatural witnesses (saksi) of ancestral spirits and beings present in

sacred places. During the closing of *sasi*, the ritual practitioner circumambulates the entire terrestrial boundaries of the communities land-based *petuanan*. While circling about the community, he blows on his conch trumpet, declaiming sacred verses in ritual speech. The ritual practitioners' journey simultaneously maps out the physical-topographical boundaries of the community's *petuanan* and effectively communicates the closing of the season to the human community.

#### (e) Geographical Distinctions and Sasi Boundaries

In the marine sphere, many Moluccan communities are oriented by the distinctions and boundaries they make between shallow areas of the inshore sea and the deep waters that begin immediately where the islands' underwater shelf plummets abruptly into the depths. The inshore area, between the uppermost area of the shore touched by the high tide line, and the lower edge of the shelf exposed at the low tide line, is known as the *meti*. The deep water beyond the island shelf or reef edge is frequently known as the "black water". The distinction between shallow, accessible shelf and the deep ocean waters is also made by the terms "white water" and "black water". If the reef or shelf drops abruptly and precipitously, forming a clear line between relatively shallow waters and very deep waters, it is also used in mapping and recognizing inshore geography and marine rights.

Customary law regulating seasons, gear, and other aspects of marine exploitation are articulated in relation to these crucial geographic and ecological distinctions. Most customary marine law regulations apply from the edge of the low tide mark on the shore to the drop-off. A less precise way of indicating the area in which customary law is valid is to say it applies to the "white water" while the "black water" is outside the community *petuanan*. White water, or areas in which the island shelf is still visible, may extend to depths as much as 15 meters. The boundary of community waters may extend 10 or so meters past the place where the shelf is no longer visible.

The operating principle linking seasonal prohibitions to the defined resource areas is that access to areas from the low water line to the edge of the drop off (or depths greater than 15 or 20 meters) is based on and limited by community rules and institutions. The area between lateral boundaries on the shore and the black water at sea is an area of limited access. Generally speaking, beyond depths of 15-20 meters, any fisherman may come to fish, at any time, and use gear of his own choice. As fishermen said on Saparua island, beyond the "white water" it is a free ocean. The converse is also true: within the clear, inshore waters of the reef and the visible island shelf, fishing practices and entry to the fishery is not free. Rather, it is regulated by community norms and under the jurisdiction of community legal institutions and sanctions.

Why is the drop-off the boundary? There are sound ecological, economic, and management reasons why this natural topographic edge would be chosen as the legal and jurisdictional boundary of the community's commonly held inshore waters. The presence of marine commodities - mother of pearl, trochus, sea cucumber - is concentrated in these relatively sunlit, shallow waters. Schooling fish, which may in the past have provided the critical sources of protein to coastal, island dwelling peoples, and which continue to be important today, frequently enter shallow coves and stay for weeks at a time - accessible to

collective fish drives as well as individual initiatives. From the perspective of surveillance, waters more than a few miles from the coast are hard to monitor, and moreover, it would be difficult to pursue and punish distant offenders. The areas between promontories, relatively close to the coast - where hundreds of species of fish, plants, birds, as well as marine mammals congregate - are sources of subsistence, economic gain, located in areas that are socially manageable.

#### (f) Species regulations

In many villages on Saparua island and on Halmahera, there are different rules applying to different kinds of fish, based on whether the fish inhabit the petuanan on a year round basis or whether the fish arrive in schools, during particular seasons, and remain in the area for only a few weeks or several days. The distinction in fish species and the regimes under which access to them is governed is between schooling fish and non-schooling fish. It is probable that the non-schooling fish are fish associated with the nearshore waters and are semi-permanent residents of the reefs and drop-off.

The general rule of access is that local people have the right to fish for practically any fish that swims in the petuanan. However, for certain schooling fish that arrive from the ocean, special rules and a *sasi* season pertain.

When schooling fish, including tuna arrive from the ocean and begin to enter the bays and inlets of a particular petuanan, fishermen immediately report the presence of the school to a *sasi* official or fishing ritual practitioner, who immediately paddles out to the area, dons his goggles and observes the state of the swarm. He pays particular attention to their movements. If he thinks that the entire school is still in the process of entering the bay and has not yet settled down, then he will prohibit the catching of this particular fish.

A body of rules immediately go into effect: (1) capture of this fish is prohibited with any gear until *sasi* is opened; (2) no fishermen can go near the area where the school is circling, less they be disturbed, leave the area of the petuanan and head out to sea.

If *sasi* official determines that the entire school has entered the bay and has settled down there for a few days, he may open *sasi*. Alternatively, he may reach the conclusion, on the basis of his observations of the school, that the swarm is about to leave the cove and head out to sea, he will immediately declare it open season on this particular fish. Depending on the locality, stringent regulations may apply to gear and behaviour in the pursuit of these schooling fish.

Regulation on gear type vary considerably between communities. When *sasi* is opened for schooling fish in certain Halmaheran coves, the indiscriminate, uncoordinated use of nets of any kind is expressly forbidden. In the central Maluku, the use of a throw net by men standing in a boat near the fish school is also prohibited although throw nets are permitted to be used if the fisherman is standing in very shallow water (far from the swirling school) near shore.

The reasons for these restrictions on gear and behaviour are based not on considerations of environmental sustainability, but rather on concern for hunting success and social equity. The prohibition against nets of any kind is to insure that the gains of the hunt are distributed equitably. As one fisherman from Peparu village, on Saparua island, stated:

"The use of a throw net from a boat was prohibited for one main reason. Only certain people can afford to use a throw net and if they were allowed to use it then only those particular fishers would obtain an inordinate amount of fish. If they were allowed to use their nets from their boats, they would obviously catch a lot of fish. This rule is an ancient ruling handed down by the old people."

Mobile stocks are considered common property in part because these "temporary residents" are hunted and caught collectively. Gear, location, and time restrictions are enforced to insure the catch effort is successful and that no participating fisher has an unfair advantage.

A young man from Teluk Kau, Halmahera, described prohibitions and collective fish drives in his village:

"Everyone within the village is entitled to fish for almost every kind of fish within our bay. It is only when schooling fish enter the bay that strict prohibitions on timing, gear, and behaviour go into effect. If schooling fish are sighted, they are reported to the chief men who go out to observe the school. If they open the *sasi*, then a fish drive begins: about 40 boats from our village, each with a crew of four, paddle toward the school and surround them, driving them in a panic and into a circle. As fish are driven into a frenzy, and try to escape the circle of boats, they jump right into our scoop nets."

Generally, open *sasi* on schooling fish is only open to local villagers, who have full rights within the time allotted to capture fish for subsistence and for resale for profit. In Desa Porto, on Saparua island, outsiders are occasionally permitted to participate in the fish drive or hunt individually. If outsiders intend to fish for subsistence purposes alone, they must first report to the chief fisherman and get his permission. However, if outsiders wish to resell their catch for profit they not only must report to the chief and secure his permission but must pay a fee.

It is clear from these cases that local communities distinguish subsistence fishing from commercial (resale) fishing, and that different kinds of legal regimes and moral considerations (permissions and fees) apply.

#### (g) Gear Regulations

Gear regulations seem to be enforced particularly when *sasi* is opened, but some of them may occur during open and closed *sasi*. Section 4 mentioned one group of gear regulations that go into effect when there is closed and open *sasi* on schooling fish:



1. When schooling fish are present in the petuanan waters, the use of non-throw nets like purse seines are forbidden.
2. Use of throw nets is only permitted on the shore or in very shallow waters (with the user standing on ground); throw nets used from boat may be used but the thrower may not stand (this will frighten the fish into a panic and threaten the venture). The use of throw nets also gives certain persons an unfair advantage to capture inordinate amounts of fish.
3. Use of tanks and deep diving gear to harvest trochus, mother of pearl and other valuable seafood commodities is prohibited on Hatta island, but permitted on Saparua island and some areas of Halmahera.

It is clear that many gear restrictions are explicitly designed with concerns for distributive justice and equity in mind. Gear rules such as these are intentionally implemented in order to promote fairly even chances among villagers to harvest subsistence foods and commercially valuable seafood commodities and to prevent, through a sharp advantage in gear efficiency, unequitable concentration of the profits in the hands of the few families able to afford expensive diving gear.

In some areas close to markets for seafood, where a longer history of centralized governmental or private sector control over inshore seafood commodity harvests exists, tanks and diving gear may be permitted. In certain villages in the central Maluku, for example, local governments with the approval and signatures of officials, have asserted monopoly rights on all trochus and other valuable molluscs. In some villages, moreover, local villagers have been forbidden to harvest any marine commodities or even to swim in their own petuanan. Local governments assert the right to determine which private sector parties are auctioned the rights to harvest and buy trochus from local territories. In certain areas, not even divers are from local communities, but are, rather, outsiders paid by the contracting company that successfully bid on the trochus harvest.

#### (h) Species Specific Regulations on Resident Stocks

With the exception of the rules on the capture of mobile, temporarily visiting species of pelagic fish such as tuna, the most important kind of sasi rules pertain to specific species of resident, non-mobile stocks which live in the inshore waters. A diverse group of rules and strategies has been elaborated, and continues to develop, in relation to the rights to harvest and market these goods. It is not an understatement to say that the development of customary resource management rules, institutions and strategies for the regulation of these resident marine creatures is among the most significant developments in law, environmental management, and community development in the vast region of Maluku province, during the period 1970 to 1990.

#### (i) Basic Regulations on Inshore Sedentary Marine Organisms

During the 1980s and the early 1990s in many villages of the central Maluku, local government initiatives to codify and centralize control over customary sasi rules and

institutions have resulted in published regulations governing access to sedentary species and reef areas residing in the community management area or petuanan. These attempts at rationalization of the rules affect:

- (a) time of open and closed harvest seasons;
- (b) permitted gear;
- (c) behaviour of local and non-local residents;
- (d) size of animal harvested.

In addition, there is a host of other, related rules regulating property rights over the harvest, the flow of benefits, and marketing strategies. Finally, there is a group of critical rules and questions concerning environmental sustainability issues, biological diversity, and economic viability of this system.

## 2. Object of the Regulations

A variety of sedentary or resident species of marine life are subject to the regulations of *sasi*. The most important resident creature subject to *sasi* regulations is the trochus (*Iola*). Other resident creatures to which access is regulated are sea cucumber and coral.

### (a) Seasonal regulations

In conjunction with other functionaries and the local fishing chief, yearly decisions are made as to when to open and to close the harvest season. It is not clear whether the same "open season" is used for all these sea food commodities, or whether different seasons are declared during different times of the year.

With slow growing, semi-resident organisms such as the trochus, the most important time-related decision concerns the number of years between harvests. Preliminary data strongly suggest that at least since World War II, the interval between resident organism harvests has decreased. The gross amount harvested has also decreased although the profits on these lower yields have risen.

### (b) Gear regulations

In Desa Nolloth on Saparura island, for example, in areas where there are known concentrations of these commercially valuable organisms, local residents are forbidden to use any kind of net. In some villages, where government monopolizes control of the profits from the trochus harvest, non-local hired divers are permitted to harvest the crop using scuba gear. By contrast, on P. Hatta, near Banda Naira, scuba gear is forbidden (except for tourists from an internationally famous resort on Banda Naira island) in order to equitably distribute the profits from the *Iola* harvest among participating families.

(c) Size regulations

Stringent size regulations are applied in many of the Moluccan islands where a commercial harvest of resident sea creatures is well developed. On Saparua and Hatta islands, harvest of trochus less than 5 centimetres or three fingers in width is not permitted.

Regulations on minimum trochus size do not appear to have been set by local communities conscious of environmental limits and management principles. Rather, government officials or private sector buyers have asserted minimum size thresholds for permitted harvest. On Hatta island, for example, non-local shell and sea cucumber merchants refused to buy trochus shell less than 3 fingers in width. The strong hypothesis suggested here is that markets, in conjunction with private sector firms and governmental officials, are driving change in sasi institutions and legal rules, with complex results. How these changes affect environmental management incentives and effectiveness as well as and community benefits, is in need of more thorough investigation. Nor is the nature "of the environmental management story" clear. In some cases (as the above), private sector initiatives seems to have generated the idea of size limits - a positive step in successful trochus management. In other cases, rising market values act as incentives leading local villagers to deplete local reefs heedlessly.

What is clear is that value has been created in hitherto unrecognized on non-commercially valued creatures; that exploitation pressure and the actors positioning for control of access to that resource is increasing, and that competition for and pressures on local reef resources is increasing. More research needs to be done to see what constellation of factors and actors - local, regional, and even international - leads to successful efforts to sustainably manage reef resources in the Maluku. Under what conditions do local communities collaborate and coordinate to conserve their resource base?

(d) Areas closed and opened to harvest

This depends on the ecological context. On Hatta island, where the coastal shelf is absent from one particular promontory to another, no seasonal prohibition of lola' is declared, while it is in effect along the remaining stretch of coast where lola' are evenly distributed.

In the Porto area of Saparua island, where trochus and sea cucumber are evenly distributed, sasi is closed and opened throughout the area. In Desa Nolloth on Saparua, where lola' and cucumber are concentrated, sasi is opened simultaneously in those areas of concentration. The boundaries of these smaller subdivisions of sasi are marked by trees tied with leaves on the shore.

(e) Limitations on access to locals and non-locals

Recent regulations on resident organism harvests, not only establish the customary regulation prohibiting non-locals from capturing local stocks, but explicitly forbid any person, whether local or not, from doing anything in the area of the sasi.

### 3. History of sasi Systems: Speculations on the Relationship between Markets, Needs and Customary Law

Although evidence is necessarily patchy, a variety of sources suggests that dramatic changes are being wrought on the customary sasi management system since the 1970s. The following is an admittedly speculative outline of the history of the sasi system, the kinds or recent changes in that system, and the probable effects of those changes on the benefits local fisherfolk derive and the effects on the environment.

#### (a) Common property:

In many areas of the Maluku, possibly for hundreds of years, dual systems of sasi, one on land and one on sea, have operated. Generally, land ownership on land was in the hands of private families or clans. On sea, however, in the waters of the *petuanan*, most organisms were considered common or jointly held property of all citizens in the community.

#### (b) Subsistence management of mobile pelagic stocks:

In certain communities marine sasi prohibitions were only applied to the opening and closing of capture activities concerning large schools of non-permanent fish. Sasi rules did not exclude any community members from access to the fish, but regulated and coordinated actions (and gear, etc.) so as to maximize the successful capture and harvest of large quantities of marine protein through collective drives or hunts. Although access to the fish schools were regulated, there may have been no limits on the amount an individual was allowed to capture. In short, although access to fish schools in the communities waters was subject to stringent regulations and collective coordination, individual gains were not limited.

This system of regulation might be considered a subsistence system, as it is oriented toward obtaining and equitably distributing marine protein among community members.

#### (c) Market driven prohibitions:

The historic development of markets for sedentary marine organisms of the inshore waters of the Maluku probably led to a parallel sasi system regulating rights and access to valuable, non-mobile resident species including trochus, beginning in the 1970s. Some sources suggest that trochus or other molluscs (perhaps giant clam, *Tridacna gigas*) were the object of subsistence economies since the 17th century. This recent study suggests that inter-island and international markets for such organisms has led to changes in the institutions, rules and property rights governing their regulation.

(d) Common property in commercially valuable species:

Most evidence suggest that the residents or a particular area had common or joint rights of use and harvest over the sedentary marine organisms. In certain cases, residents may have been required to surrender a few trochus shells to local rules or nobles, but once the sasi prohibition on these organisms was opened, local families were free to obtain as much as they wanted, whether for food consumption or for profit in the markets.

An example from an isolated community in Halmahera suggests how, in the absence of markets, resources are unregulated and how open-access regimes may prevail. In an isolated cove in Halmahera, local residents have notoriously strict rules regulating the capture of schooling fish. However, they have never used or sold marine organisms such as trochus or sea cucumber. As a result of the absence of subsistence values or market values, they have an open-access regime toward harvest of sea cucumber and trochus by outsiders in the early 1990s. It is probably only a matter of a few years before the values associated with these organisms lead to the creation of stringently enforced community regulations and property rights.

**4. Recent Changes in the Allocation of Rights, Responsibilities and Benefits in the Management of Inshore Resident Stock**

Although sasi regulations on inshore marine organisms may have a long history, it seems clear that dramatic changes in the allocation of rights and the management of inshore marine environments began during the past few decades and continue to develop. These changes include appropriation of the sasi system by government officials on the grounds that the needs of the community as a whole are so great as to warrant the de facto confiscation or annulment of joint rights by local residents. In other areas, private sector control of the flow of credit to local fishers and control of the flow of benefits from community-managed reef resources may become a dominant dynamic, affecting equity and de facto rights.

The appropriation of economic rights and monopolization of the sasi system by local government or private sector initiatives has been accompanied by a centralization of control over the harvest, processing, and marketing arrangements. In Desa Nolloth, local people have been excluded from directly profiting from the free-market sale of lola, but they are paid wages as labourers from the local government. In contrast, in Porto village on the same island, divers from the local community are hired, paid wages and given food. Local women are provided with wages for trochus processing.

Whether local people are benefitting from recent governmental and private sector initiatives to reshape the sasi system is unclear. Two questions remain to be answered: what have been the concrete, measurable, material gains and losses resulting from this reallocation of rights? Secondly, how has the manner in which this allocation taken place affected democratic processes, including village traditions of consensus, agreement, and resource management authority?

## **5. Environmental Effects of Decreasing Intervals between Sasi Harvests of Sessile Marine Organisms**

Since the 1960s, the yearly interval between successive harvests (sasi openings) of resident marine organisms including pearl shell, trochus and sea cucumber, has declined in many villages. In Desa Nolloth on Saparua island, for example, the yearly intervals between harvests have declined from an average of four years to harvests conducted every successive year. The interval between successive harvest constitutes an "environmental rest period" during which stocks may reproduce and mature without exploitation pressures. Parallel with the long term and regular decrease in "rest period" in Nolloth's inshore environment is what appears to be a serious decline in productivity.

For example, yields between 1969 and 1978, when the interval averaged three or four years between successive harvests, were between 4,100 and 3,050 kg of trochus. However, when the 1979 harvest followed the previous 1978 harvest without a "rest period", yields declined from a 3 100 kg level (1978) to 1 100 kg (1979). Moreover, yields in 1980, the second consecutive harvest without any "rest period", resulted in yields of only 800 kg.

After the disastrous yields of 1980, sasi lola' was closed until 1984, and the 4 year interval apparently allowed stocks to recover. The 1984 harvest rose to 2 500 kg. However, the generous 4 year interval was reduced to a 2 year "rest period" and the crop was harvested in 1986. During that year, stocks again declined to the 1,550 kg level. Moreover, from 1986 through 1990, the local government permitted yearly harvests of lola'. Such "regulation" has resulted in the progressive and disastrous decline of stocks and economic yields from the harvest. Similar instances of declining yields and reduced "rest period" between harvests were witnessed in Banda.

In part, responsibility for these declines rests with the local governments who have increasingly extended formal jurisdiction over the harvests of commercially valuable marine organisms. If local governmental leaders are to retain their centralized authority over the opening and closing of sasi, as well as in shaping the contents and legal formalization of new rules, then they must formulate sustainable and equitable environmental management plans in order to halt the progressive impoverishment of biologically diverse and commercially valuable inshore marine organisms. The effects of increasing private sector control over local community institutions and marketing arrangements should also be researched and assessed, with the goals of community equity and sustainable environmental management in mind.

## **6. Monitoring and Implementation**

Wherever sasi regulations are applied to management of the marine sector in the Maluku, institutional arrangements exist to implement these rules, monitor conditions and activities on the coast and waters, report these violations and violators to authorities and processes by which the violators are brought to justice and sanctions are imposed. The degree of institutional elaboration for implementation of these rules varies considerably from community to community.

The basic process is based on a community that is motivated to implement their laws within a well-known and bounded space - the community *petuanan*. The simplest kinds of systems as well as the most hierarchically elaborated and structurally differentiated depend on a community in daily contact with the marine environment. It is common fishermen, on the sea or on the shore, who are the agents of implementation; they observe conditions in the *petuanan*, notice new arrivals and activities which may violate local *sasi* law.

Fishermen's reports are immediately conveyed to officials, sometimes known as *kewan*, as well formal government heads. These officials make decisions as to how and whether to pursue the violators. If the violators are caught, decisions are made as to the kinds of sanctions to be imposed upon them. Again, it is common fishermen who constitute the monitoring, control and surveillance force that effectively administers and enforces community law in the marine sector.

## **7. Institutional Structure**

These are enormous regional variations in the formal institutional structure (or lack of one). In the Porto community, there is a complex administrative structure. At the top of the administrative structure in the Chief *Kewan* who oversees administration of all environmental regulations in both forest and marine sectors. Under him is an assistant, the Secretary. Administrative responsibility for implementation of *sasi* rules was historically divided between controllers for the forest and the oceans respectively.

Under these are the adult persons who implement the orders of their respective *Kewan*. These are also people whom the *Kewan* orders to do small but essential administrative tasks, for example to tell the community that a meeting is about to take place, or report to the *Kewan* on developments reported in the forest or on the ocean.

## **8. Public Knowledge and Implementation**

In the absence of statute books (although many areas in the islands have codified *sasi* regulations and sanctions from the colonial period), public knowledge of the existence of *sasi* regulations in particular areas is disseminated through word of mouth. Public knowledge of the effective implementation of *sasi* regulations in distant regions operated over long distances. In To Belo, on the northern tip of Halmahera, fishermen knew all about stringent regulations in effect in a small cove 8 hours away by motor boat. When asked whether what the local people would do if they flouted their regulations and fished, their chief said: "They would kill us!".

Outsiders are also given public notice as they approach particular coves or bays. When they anchor at night, they learn from local people about the rules in effect in nearby areas. Finally, in some regions as noted above, the natural landscape is signed (prohibition symbols are literally tied to trees and other objects) indicating in no uncertain terms that resource taboos and rules are in effect.

## 9. Sasi Sanctions

A variety of sanctions were and continue to be enforced for infractions of sasi rules including fines, public shaming, temporary confiscation of fishing gear, permanent confiscation and sale of the gear, and corporal punishment.

In the pre-independence period in Desa Nolloth (Saparua island), there were three dominant forms of sanction, the imposition of fines, corporal punishment and shaming. In Nolloth today, fines are still imposed for violations of sasi rules on the land and the sea. People who are caught using nets in a closed sasi area, who have been seen swimming or diving in that area (during a closed sasi period) are fined Rp. 25 000 per person. People who have been caught taking trochus are fined Rp. 7 500 for each large animal taken and Rp. 2 500 for smaller creatures.

In the past, if the infraction of sasi was relatively minor, violators in Desa Nolloth were also the recipients of corporal punishment. They were struck repeatedly with rattan lengths. If the infraction was rather serious, however, violators were publicly shamed by attaching "signs" or marks to their bodies or clothing. Violators of sasi prohibitions considered "heavy" or serious were also "shamed" by being signed or tied with the same sign used to indicate the being-in-effect of the prohibition.

In other areas of Maluku today, the gear of the violator will be temporarily impounded. Depending on the result of negotiations between the violator and community leaders, the gear may be returned to him if he promises never to repeat the violation. If the violator is not trusted or has repeated the infraction, the gear may be permanently confiscated and sold. Exile from the community is another serious form of sanction that continues to be practised in certain isolated regions of northern Maluku.

## III. CONCLUSION

The findings of this preliminary study indicate that the existing community management practices, laws, and institutions in the Maluku are models of effective and efficient institutions. They are:

- (a) Inexpensive: operated by local people who are on the seas and coasts as part of their daily work.
- (b) Efficient: local people, who obtain their living from the sea, have a high incentive to obey the rules themselves and to enforce the rules against other violators within and without the community.
- (c) Environmentally appropriate: since many of the marine organisms under community regulation are high-priced marine commodities or important to local fishers as subsistence products, local communities have a high incentive to regulate access and exploitation pressures on these resources in a sustainable manner.



- (d) Modifiable: because these laws have been designed and implemented by local, face-to-face communities, they can be easily reshaped and tailored to fit changing circumstances (i.e., threatened economic returns, threatened species or new markets for new products) with a minimum of red tape and cumbersome legislative proceedings. Village traditions can be used as a cultural asset that simplifies cumbersome legislative procedures.
- (e) Economically efficient: the effectively implemented rules and functioning institutions that regulate access to these marine resources are the guarantees of economic benefits to these local coastal communities.
- (f) Security concerns: alienation of local fishers leads to law breaking and in cases of severe conflict, violence. Formal recognition of these systems and the rights they sustain reduce the costs and losses sustained under an open-access "free for all" in the marine sector.
- (g) Conservation and sustainable development: community systems of law and rights which guarantee local fishermen and equitable right to manage and harvest inshore marine stocks - mobile and sedentary - increase the opportunity to develop practices which are economically sustainable and conservative of biological diversity. In short, recognition of community rights can support two other policy goals of the marine sector - sustainable development and biological conservation.

The community marine management institutions of the Maluku should be sustained and supported by governmental and international development efforts as social and legal institutions which can help to increase the income of impoverished coastal communities, manage sustainable levels of economic exploitation, and act as social instruments to conserve biological diversity. These institutions and the rules they administer, however, are not perfect. Further efforts are, however, needed to evaluate the status of these systems, their effects on local environments and biological diversity, as well as the effects or recent governmentally induced changes in these systems.

## ENHANCEMENT, EFFICIENCY AND EQUITY TURFS:

### EXPERIENCES IN MANAGEMENT

by

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#### ABSTRACT

An essential prerequisite for community-based management of fisheries is the availability of Territorial Use Rights in Fisheries (TURFs). The basic problems lie in the use of those rights. Three different types of TURFs are identified: (a) those serving to enhance total returns; (b) those designed to achieve efficiency through increased net returns; and (c) those designed to achieve equity among users as a means for achieving community stability. These different types differ in terms of the kinds of participants and beneficiaries, as well as in the benefits sought. Each approach has its own set of difficulties and problems but they are all preferable to the condition of free and open access that exists in general.

#### I. INTRODUCTION

The management of small scale fisheries in tropical developing countries is extraordinarily difficult for a number of reasons. Generally, small scale fishers harvest a wide range of species and use a large variety of craft and gear, making it difficult to evaluate yield functions and the economic wellbeing of their activities. Their communities are frequently dispersed and isolated and often have disparate social and cultural characteristics. This impedes the formulation and implementation of effective management measures by central governments. In many situations, the resources available to small scale fishing communities have become depleted, either by their own actions or by large scale operations. Although there is an urgency to the need for effective management, the depletion of the stocks together with the generalized absence of alternative employment opportunities, makes it difficult for the local fishers to adopt the restraints needed at present to achieve higher returns in the future.

The exigencies for better fisheries management combined with the growing awareness of the imperfections of the conventional centralised approaches is forcing consideration of the devolution of management authority to communities of small scale fishers or to local governments. Simultaneously, there is increased interest in the community-based management systems that have existed in the past and that continue to exist in certain situations. These

considerations are reflected in many of the recommendations adopted at the FAO/IPFC Symposium on the Exploitation and Management of Marine Fishery Resources in Southeast Asia (Indo-Pacific Fishery Commission 1987) as, for example:

- ✧ Exclusive access rights to fisheries should be granted to individual fishermen, groups of fishermen, or to communities.
- ✧ The devolution of management responsibility from Governments to local fishermen groups is seen as a desirable and gradual process linked with the capacity of the community to effectively manage its affairs.
- ✧ The establishment of exclusive fishing zones or (territorial use rights in fisheries) should be considered as a means of managing inshore fisheries in those situations where conditions are appropriate.

This focus on territorial use rights in fisheries (TURFs) is essential, since community based management without such rights cannot be effective.

There are two basic aspects to the consideration of TURFs as a basis for fisheries management. One is that of the benefits and costs associated with the creation of TURFs; and the other is that of the benefits and costs associated with the management of TURFs, which have already been created. The first set of issues is discussed in a separate paper for this Consultation (see Christy 1992). The second set is discussed here, particularly, but not exclusively, in terms of the case studies presented to this Consultation. There is some degree of overlap between the two papers, since the reasons for the creation of TURFs generally serve as the objectives for their management.

The Japanese TURFs are a notable exception to this rule. In this case, the territorial rights appear to have been created primarily for reasons external to the communities rather than as means for meeting community objectives. "In order to secure peace in fishing communities and stable tax collection, the then Japanese feudal government introduced a standard regulation in 1743, called 'Urahoau' to govern fishing villages and manage fisheries" (Hirasawa 1992). Under this regulation, "each local lord (han-shu) owned the adjacent coastal waters and controlled the fisheries therein" (Matsuda 1991). It can be suggested that the extraction of economic rents, through taxes, was the primary reason for the establishment of sea territories.

"The Meiji Restoration of 1868 put an end to such a feudal style of fisheries management" and "the abolishment of the feudal system led to an increasing number of new entrants to the fisheries...and to many disputes and troubles concerning fishing operations and use of fishing ground of coastal fisheries" (Hirasawa 1992). These difficulties eventually led to the re-establishment of territorial rights in coastal fisheries but with the rights being held by fishermen's associations rather than the feudal lords.

"It should be noted that a 'fishing right' does not allow an exclusive use of a fishing ground or an exclusive use or occupation of any water surface. It is only for a specific fishery in a specified area" (Kawaguchi and Naruko 1992). The fishing rights, however, are still considered to be part of a TURF since a territorial limit is still a dominant characteristic.

In a sense, then, the Japanese fishing communities have inherited territorial rights rather than acquired them through their own initiative. Their major challenge is that of determining how to maintain and use the rights rather than how to establish them. This allows a much greater degree of flexibility than exists in other situations.

Where TURFs already exist, both in Japan and elsewhere, they can be divided into three types according to the major objectives being sought. This paper identifies and describes the three types and provides an evaluation of their success in reaching their objectives as well as achieving effective fisheries management.

## II. TYPES OF TURFS

Basically, the three kinds of TURFs are: (a) those designed to enhance total returns, either yields or revenues; (b) those designed to increase net returns; and (c) those designed to reduce conflict and achieve stability in the regime. In some cases, there has been a change from one set of objectives to another as the TURF has evolved, or two or more of the objectives may be sought simultaneously.

In Type 1, there may be several different kinds of situations where enhancement of total returns is the objective. The stock may be depleted and require measures to postpone harvest either by closing seasons or enlarging mesh sizes in nets. Direct enhancement by planting of seed stock has been adopted in some cases. Enhancement is possible through the use of artificial reefs (ARs) and fish aggregation devices (FADs) although these may achieve their objective more by aggregating fish species than by increasing the biomass. Increased total returns may also occur through the control of landings to prevent market gluts and ensure higher prices.

Type 2 might be called the "efficiency goal". Even though economic efficiency, in the sense of maximizing the difference between total costs and total revenues, is not generally stated as a goal, these systems tend to achieve a degree of economic efficiency. The management of these fisheries is designed to produce and capture a surplus benefit. This occurs most directly when the TURF is operated to produce economic rents, such as when the individual or group claiming the exclusive right, collects taxes, user fees or shares of the product from the fishermen. The surplus, however, may also be non-monetary as, for example, when a TURF is managed so as to produce a large quantity of highly valued species to be used in a feast.

The third type is referred to here as the "equity goal". For these TURFs the main objective is to resolve conflict and achieve stability within the community of users. This is generally done by measures that distribute wealth, either in terms of equitable access to the resources or directly in the pooling and distribution of net revenues. These kinds of measures are adopted when there is congestion around valued fishing spots (including artificial reefs) or at season openings, or conflicts between different kinds of gear.

The three types are discussed below with regard to the investors (or initiators) who may be individuals, user groups, communities or government; the benefits that are produced;

how those benefits are shared among the members and how members are defined; and the problems<sup>1</sup>.

#### A. Enhancement TURFs

Within TURFs, some communities have adopted conservation measures to control fishing rates and allow rehabilitation of over-fished stocks. It has been noted that small scale fishermen "often cannot afford to accept fishing restrictions for the sake of benefits tomorrow" (Hirasawa 1992). But when the group of fishermen can operate effectively as a unit with sufficient control over the resource so that they acquire the benefits and when the benefits of the measures are relatively quick to appear, such restrictions can be adopted. For example, in the case of the Haragama Fisheries Cooperative, experiments in the use of a large size mesh in the gillnet fishery for flatfish led to a decline in the total quantity of catch per length of net but to an increase in the size of the fish and in the value. One month after the experiment, all gill net fishermen in the cooperative had adopted large mesh nets (ibid.).

Enhancement of returns can also be achieved by measures that control the flow of the catch to the market. One example occurred in the Yokohama City Fisheries Cooperative. "Triggered by a sudden decrease in the value of mantis shrimp following a bumper catch during the latter half of the 1970's, this cooperative started to limit the total catch by allocating individual quotas to each boat in 1977 in order to restrict the supply to the market...The total catch control was originally started for the purpose of maintaining prices. It is worth noting that this original method was gradually developed into achieving other economic purposes" (Hasegawa 1992). The control of market prices is not an uncommon motivation for cooperation among fishermen. Other examples include the "prudhomme" fishermen in southern France; the Mar del Plata fishermen in Argentina (Alberto Gummy, pers. communication); and the porgy fishermen in New Jersey (McKay 1989).

A more direct form of enhancement is that of cultivation of stocks. This can be undertaken by individuals, user groups, communities or the government (local, provincial or national). The scale generally depends upon the degree to which the investor in the technique can capture an adequate return on his investment. Where the costs of obtaining a territorial right are low and the benefits are high, the claims are frequently made by individuals (eg. oyster and mussel culture). At the other extreme, where the benefits accrue to a large number, government is usually the investor. In between, there are many situations where communities and user groups can capture enough of the benefits within a territorial right to justify their own expenditure in culture.

Ancient enhancement techniques which have become quite popular in recent years include the planting of artificial reefs and fish aggregation devices. As in the case of cultivation techniques, investment can be made by individuals, user groups, communities or the government, depending upon the ability of the investor(s) to capture satisfactory returns. In the Philippines, there are an estimated 3000 FADs in Moro Gulf, planted by individuals or companies. The returns are captured by the owners, either in the form of high catch rates

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<sup>1</sup> A somewhat similar analytical approach has been taken by Kurien (1991) with regard to the use of artificial reefs in India. He identifies the initiative as coming from individuals, groups, communities and external agencies and the users as groups or communities.

or user fees charged to other fishermen (Aprieto 1991). In Sri Lanka, on the other hand, FADs have been planted by the government. "The major problem is the ownership and collective use of FADs. In the experimental work conducted in Sri Lanka, the beneficiaries, viz; fishermen fishing around FADs, were not the owners and their contribution to the construction and deployment of FADs was nil...This poses a major management problem as the FADs do not belong to anyone while everyone wishes to fish around them...In this context, investigation of the possibilities of a collective community approach to the deployment of FADs is of extreme importance" (Atapattu 1991).

A particularly interesting situation in the state of Kerala in India is described by Kurien (1991). Here two separate kinds of efforts have been made to establish ARs. In one kind, an AR is erected by a group of fishermen who then control access to the reef, thereby limiting the benefits to themselves. In another kind, the investment in the AR is made by a group of fishermen or the community as a whole on the basis of "whatever each one can give happily", and access is open to all members of the community. Proponents of the latter approach reject the "privatisation" and "narrowness" of the former, more restricted approach. However, they also find that "certain community agreements need to be evolved to restrict fishing effort by individuals. For example: there should be a limit placed on the number and size of hooks used...(to ensure) a more equitable distribution of the catch".

Several points emerge from this discussion. The objective of enhancing the total returns from a fishery do not necessarily require a TURF. Governments can take the appropriate measures, such as imposing conservation controls, investing in the culture and release of seed stock or the planting of ARs and FADs. But, as noted in the case of Sri Lanka, the benefits produced are likely to be quickly dissipated. Indeed, the use of ARs and FADs without some form of control over access, will tend to exacerbate overfishing and increase the problems of congestion.

With a TURF in place, however, those who have the exclusive rights will have an interest in preventing excessive use since the benefits of the measures will accrue to them. The questions raised above have to do with the characteristics of TURF ownership. In the case of the Philippine FADs (payaos), the territory around the FAD is claimed by individuals or individual companies and the benefits accrue to those individuals. In most Japanese cases, a user group (the fishermen's association) makes the investment and generally the benefits are appropriated by the members of the user group. When the benefits are not satisfactorily appropriated by the user group, the system is likely to be less successful. As noted by Hirasawa (1992), "where the total value of catch from the resource over which fisheries management has been practised has increased, those who have cooperated and taken part in such management measures will wish to receive their deserved fruits and profits. If the fishery is then opened and a free entry system is adopted, enabling anybody to get the benefit, joint cooperative action is rendered impossible. In short, the fisheries management can only be realized by limited entry."

A somewhat contrary position is taken by Kurien (1991) with regard to the ARs in Kerala. He states that "the convergence towards community use of (Peoples Artificial Reefs) is a resolution of a dilemma and a reaffirmation of a choice (made by fishermen) that the coastal waters are their social asset and should not be privatised by individuals or small groups" (underlining in original).

It can be suggested that the issue depends, at least in part, upon the size of the group and the extent to which it represents the interests of the community from which it comes. But it also depends on other objectives as well which include the extent to which the management measures produce surplus benefits (as discussed in the section on "efficiency TURFs") or improve the stability of the community (as discussed in the section on "equity TURFs").

These are important aspects because the enhancement of total returns may increase benefits to consumers by increasing total production but does not, by itself, increase the welfare of the fishermen or the community. That will occur only if there is an increase in the net benefits produced or if there is a reduction in conflict.

## B. Efficiency TURFs

Efficiency TURFs are those that are managed with the objective of producing a surplus return (or economic rent). That is, they combine enhancement measures with direct or indirect control over the amount of fishing effort and therefore achieve an increase in total revenues at the same or lower total costs (including opportunity costs for capital and labour). The difference between total revenues and total costs is a surplus profit, or economic rent, which reflects the value of the resource.

As noted above, the suggestion that TURFs in Japan originated with the desire of the feudal lords to tax fisheries indicates that these originally fell within the category of efficiency TURFs since the tax represented an economic rent that would otherwise have been dissipated under the condition of free and open access. A tax is an indirect form of control over fishing effort in that the tax constitutes an extra cost (a disincentive) which dissuades superfluous fishermen from entering the fishery.

An interesting example of an efficiency TURF that is currently operating in Japan is that of the scallop fishery in Nemuro Bay (Nekaikyo No. 29 Committee, 1992). Up until the mid-1970's, the fishermen from five cooperatives dredged for scallop in the area. During the period 1965-75, there were about 153 boats taking an average of about 2000 tons of scallop per year. However, in spite of various management measures, the catch declined to such an extent that a total ban on scallop fishing was introduced in 1974. The members of the five cooperatives joined together to establish a Joint Committee which engaged in rehabilitation and restocking of the scallop beds, with the help of subsidies from the central, prefectural and provincial governments. "After four years of growth, the Committee began to harvest the crop by chartering shell dredging boats from the five fishery cooperatives." In 1985, the 16 chartered boats produced over 6,600 tons of scallops and "annual profits have risen rapidly to exceed US\$ 11 million per annum". In a sense, the Joint Committee is acting as a sole owner of the resource, employing the minimum amount of capital and labour required to harvest the stocks and achieving the maximum net economic revenues. The profits are distributed among the five cooperatives based mainly on the proportion of catch taken in 1969, and then divided up among the individual cooperative members. The division among the members is based on "such factors as the number of years engaged in scallop fishery, the number of years with the cooperative, the number of shares in the cooperative and the degree of contribution to the implementation of the programme". In 1984 in one cooperative, 30% of the profits went to the cooperative and the balance was distributed to the members who received an average of about US\$ 6000.

Another interesting example is that of the fisheries on the island of Ambo in Indonesia (Naamin and Badrudin 1992). These islands have been historically fished both by the local inhabitants and by fishermen from South Sulawesi and Kalimantan, hundreds of miles away. "For the past four decades, the inhabitants of Ambo Island, the administrative centre of Desa Gaya Baru, has enforced a system of resources royalties on both themselves and fishermen arriving from outside the area." The rules require that all fishermen pay 10% of the value of their marine catches to the head of the village adjacent to the waters they fish. It appears that originally the revenues went to the local villages but that recently, there has been an "appropriation of the...system by government officials on the grounds that the needs of the community as a whole are so great as to warrant the *de facto* confiscation or annulment of joint rights by local residents" (Zerner 1992). This appropriation of the rents by government may lead to the breakdown of the system (*ibid.*).

In the town of Chilaw in Sri Lanka, the fishermen operating shrimp trawlers have reached an agreement to manage the fisheries. "The driving force for initiation of this process was the increasing incidence of conflicts among various resource users due to haphazard operation of 3.5 t boats for trawling" (Atapattu and Dayaratne 1992). The fishermen were apprehensive that the increasing number of conflicts with other user groups might lead to the banning of shrimp trawling by motorized boats. It is significant, however, that the measures also include controls on entry into the fishery. "An active fisherman from a traditional fishing family can operate up to two 3.5 t motorized craft for shrimp trawling (whereas) an active fisherman not descending from a traditional fishing family in Chilaw, but resident in Chilaw town, can operate (only) one motorized boat for shrimp trawling" (*ibid.*). These controls, in effect, serve to achieve a degree of economic efficiency and produce a surplus return.<sup>2</sup>

Other TURFs based implicitly or explicitly on efficiency objectives include the ARs in Kerala and controlled by user groups and the individual or company FADs employed in the Philippines.

These efficiency TURFs are generally initiated by individuals or user groups, specifically to produce benefits for themselves. The Ambo Island case may be an exception in that the system appears to have been established by the village communities with the benefits accruing to the villages as a whole, at least initially.

For efficiency purposes, it is absolutely essential that there be some direct or indirect control on the amount of fishing effort and on the fishing costs. For reaching the objective of enhanced total returns, such controls are not necessary. Thus, some form of TURF is essential for efficiency goals but not essential for enhancement goals, even though it may be desirable.

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<sup>2</sup> Also in Sri Lanka, regulations limiting the number of purse seines were introduced in 1986. "A high resource fee was introduced with a view to managing the fishery by limiting the number of entrants to the fishery." Although this is not management through a community based TURF, it reflects the Government's interest in economic efficiency as a goal for management.



Since control over fishing effort is essential for efficiency, questions are raised with regard to the participants, in terms of both the fishermen and the beneficiaries. Where TURFs are individually initiated and owned, the question is essentially one of political philosophy; that is, does an individual have a right to acquire property in the sea and, if so, does he have the right to take all the profits to himself or should he share those profits with society? In the case of the Philippine FADs, this question is dealt with in practical terms, although perhaps not adequately. The payao owners commonly allow artisanal fishermen to use handlines around the FAD when the catcher boats are not present. This helps to protect the payao from vandalism and poaching, but it can also be considered as a means for buying out the artisanal fisherman's right of access. There is no reason why a more formal system could not be developed. For example, FAD sites could be auctioned off to the highest bidders and the revenues could be devoted to enhancing the welfare of the adjacent small scale fishermen. Or the sites could be granted to the communities who could then auction off fishing rights or fish them themselves.

For the Nemuro Bay scallop fishery, the question of participation in the fishery is resolved simply by the Joint Committee hiring the capital and labour. The question of participation in the benefits, however, is not resolved. "As profits become larger, certain criticisms and discontents as to its distribution formulae among the cooperatives becomes greater. Further adjustments by the leadership in the interest of all will be needed" (Nekaikyo No. 29 Committee, 1992). These problems are also likely to become increasingly difficult with regard to the distribution of profits within the cooperatives. The criteria for distribution are imprecise and subject to different interpretations. Furthermore, it is not clear that provisions are available to deal with shares to members who have died or moved away. These kinds of difficulties are also likely to exist for the TURFs which pool revenues, as discussed below.

In the case of the Chilaw trawl fishery, those who participate in fishing also receive the benefits since there does not appear to be any provision for more widespread sharing of the benefits. The Chilaw trawler owners have acquired an exclusive use right to the extent that owners of motorized trawlers from outside Chilaw are not allowed to enter. There is, however, provision for other fishermen from Chilaw to enter the fishery, even if they are not "traditional" trawler owners. If the profits earned by the present members become sufficiently high, it can be expected that there will be pressure to enter the fishery, which may eventually break the system.

This problem is well stated by Hirasawa (1992). "If such new entry applicants are admitted, the erstwhile deserved share of the old members will have to be reduced. This is a problem which never fails to happen in any area or fisheries where there has been successful fisheries management and it inevitably leads to criticisms against fisheries management...The fact is that the more successful fisheries management cases appear, the more intractable question as to whom fisheries resources belong arises." This problem could be reduced, if not removed, if the Government were to tax away some or all of the surplus profits produced by the system, following the model of high user fees applied to the Sri Lankan purse seine fishermen. If they were to do this, the participants in the distribution of the benefits would be broadened to include society.

### C. Equity TURFs

The concept of "equity TURFs" derives in part from a desire to maintain stability within communities or user groups. Many of the TURFs that have emerged traditionally in isolated societies are essentially social mechanisms that serve to prevent the breakdown of the societies. Stability in such societies is threatened when there are large inequities in catches. For example, customary laws in the Moluccas, Indonesia, "are explicitly designed with concerns for distributive justice and equity in mind. These are intentionally implemented in order to promote fairly even chances among villagers to harvest seafood commodities and to prevent inequitable concentration of the profits in the hands of the families that can afford to operate expensive...gear" (Naamin and Badrudin 1992). In India, as well, there are some lagoon fisheries, whose "waters have provided some examples of traditional management systems which incorporate inherent principles of equity" (Mathew 1991).

For some observers, the basic objective of the Japanese system is to achieve equity. "The key to determining either success or failure of fishery management would rest on how to adjust discrepancies in profit that might result from differences in fishermen's age, skill, boat's size, and fishing method" (Hasegawa 1992).

Equity TURFs also serve to avoid mutual damages associated with congestion and conflict. These problems are particularly severe when the best fishing sites are restricted to small areas or when yields from a particular stock decline rapidly after the opening of the season. "A good example can be seen in the cod bottom trawl fishery management implemented in the Akita Prefecture. In 1977, 'collective' fishing became operational to overcome problems which had arisen from excessive competition among 19 trawlers on the cod fishing ground seeking the most favourable spot. A dense school of fish migrated to the very small area and therefore as the number of trawls cast increased, the productivity per boat drastically decreased. There was severe competition to secure the favourable spots and to enjoy the first haul" (Hotta, 1992). These problems were resolved by the initiation of a collective fishing system. Six of the vessels are allowed to operate on the cod grounds under a rotation system and the other 13 move to other grounds to trawl for other species. The proceeds from all vessels are pooled and distributed to all participating vessels on an equal basis after the expenditures are deducted.

Revenue pooling systems are also used in other Japanese TURFs. In the lobster fishery of the Katsuura cooperative, the season is so short that "allocating good fishing grounds by lottery or by rotation system cannot solve the questions of equal opportunity" (Katsuura FCA 1992). The cooperative therefore adopted a system which limits access to the best grounds and provides that profits are shared equally by all participants. "The main problem with a pool account system is that of the qualifications of fishermen to join this system and of limited entry. It is quite natural that when the lobster resource management succeeds and incomes per fisherman increase under the pool account system, everybody will wish to participate in the system" (Katsuura Fishermen's Cooperative Association 1992).

In other situations where seasons are longer, a rotation system has been adopted. Several such approaches have been taken in Japan. In addition, such a system has long been used for the beach seine fishery in Sri Lanka (Atapattu and Dayaratne 1992). For example, at Wathuregama there are currently 20 beach seines but only one site. "Traditionally, the fishery operations carried out...are managed through a rotation system by the community

themselves. Each beach seine has a number and is operated once in 20 days". Ownership of a beach seine includes the right to operate it and beach seines can be passed on through inheritance. "New generations are allowed to introduce more beach seines if they can afford to buy, only with the approval of the community. In 1950 there were only 6 beach seines in the community but although the increase in the number of seines reduced the number of operating days for each existing beach seine, no conflicts have so far arisen as the members of the whole community consider themselves to be one family."

A somewhat more complicated rotation system is found in Pulicat Lake in Tamil Nadu (Mathew 1991). There are only a certain number of valued sites for the placement of stake nets in the lagoon. The main fishing villages have claimed exclusive rights to these sites. "The padu (fishing site) system as practised in Pulicat may be defined as a traditional system of granting entitlements to eligible members of a particular community for undertaking specified fishing activities in certain designated fishing grounds of the lagoon." In order to ensure equitable access and opportunities, the fishermen have adopted a rotation system.

Until the 1980's, "in spite of a shrinking resource space in real terms, the conditions for becoming a padu fishermen were not very stringent". But with increasing population growth within the villages, it became necessary to establish more regulations. The fishing right was limited to married fishermen, the grounds were divided into smaller units, the crew size per boat was expanded from two to three and, in one village, a shift system was introduced dividing the allotted days in half. It is noteworthy that the rotation system has not prevented overfishing. "If the demand factor is favourable and the frequency of access to the fishing ground is limited, the tendency of fishermen, whether they are part of a self-regulating mechanism or not, seems to be to maximize individual production. The case of Pulicat lake and the padu system...highlights the fact that managing access to the fishing space does not in itself ensure the management of the resources. Fisheries with limited access can also be subject to overfishing and over-capitalization as in any open-access fishery, so long as there is no control over the intensity of fishing operations" (ibid.)

Equity TURFs, unlike the other kinds, are generated solely by the communities or user groups. Individuals have no interest in setting up equity TURFs and, indeed, may threaten their continued existence. Governments may have an interest in establishing TURFs for equity purposes but generally their major concern is in the resolution of conflict between competing user groups rather than within groups. In some cases, this may lead them to break down TURFs that already exist. In the case of Pulicat Lake, "the State government authorities do not formally recognize the control of access rights to the waters. The padu system is perceived as an exploitative arrangement by a limited number of fishermen for their own benefit. The government does not legitimize territorial use rights in fisheries and is of the view that the conflicts can be resolved only with the strengthening of the government machinery in Pulicat...The government favours replacement of the padu rights with a licensing system" (Mathew 1991). However, moving from a TURF system to a licensing system will not resolve the issue of wealth distribution. It will just change the beneficiaries from the padu villagers to those who acquire the fishing licenses which, in this case, may well be the wealthiest people in the area.

Sri Lanka has a somewhat different government position which raises a different set of problems. The stocks taken by the beach seines are to a large extent the same stocks fished by purse seine and other fishermen. "However, the beach seine is an inefficient fishing

device when compared to active fishing gears as it relies entirely on in the movement of fish shoals into the inshore seinable waters. If the Government objective of increasing fish production is to be achieved, resources will have to be exploited to the optimal level. A major issue now is whether to retain the benefits and privileges given to beach seiners and/or encourage other fisheries in the inshore waters so as to increase fish production" (Atapattu and Dayaratne, 1992). If the beach seine TURFs are abolished in favour of open access, all fishermen will eventually lose. If a license limit scheme replaces the beach seine rights, there will be a redistribution of benefits to the license holders.

These experiences indicate that the use of TURFs to achieve community stability is not always successful. For an equity TURF to maintain stability, it must distribute opportunities or shares in such a way as to make all persons who are in a position to break the system feel that they are better off by maintaining the system than by breaking it. In communities which are relatively closed and whose resources are not of significant interest to outsiders, the TURF may be effective. However, for more open communities using resources of more widespread value, the systems may break down. The latter situation is becoming more common as a result of general economic and population growth.

Questions also need to be raised about the meaning of "equity". There are no hard and fast criteria for determining whether a particular distribution of benefits is equitable or not; who should and who should not share in the benefits or how much those benefits should be. In most systems, it is likely that there are disparities in income among the members of the user group or community holding the TURF. The disparities may be due to differences in skill, equipment and other factors of production. Or they may be due to differences in an individual's influence or power within the community. If the character and significance of the disparities is acceptable to the community, there may be stability. Otherwise, the system may fail. Revenue pooling systems, seeking to adjust discrepancies in profit may achieve more "equity" in the sense that all members receive identical incomes, but it is questionable whether this solution will be viable in the long run, since there are no rewards for hard work or superior skill and experience.

### III. SUMMARY AND CONCLUSIONS

The three kinds of TURFs identified all have their separate sets of problems and benefits. As noted, those designed to achieve enhanced total returns need to be combined with one of the two other kinds in order to produce benefits for their investors. This summary, therefore, concentrates on the efficiency and equity TURFs.

The major issue facing the use of TURFs is basically the same fundamental issue that faces all aspects of fisheries management: that is, the trade-offs between achieving efficiency and equity. Although this problem emerges for all natural resources that are used in common (see Willmann 1992), it is particularly exigent for fisheries where the establishment of meaningful boundaries is so difficult.

The conflict between the goals of equity and efficiency are amply illustrated in the cases described above. Efficiency cannot be achieved without controls over access, which cannot be achieved without the exclusion of some present or potential users, which raises questions of equity. Equity, in the sense of even distribution, ultimately means that all

present or potential users have equal access or equal benefits, which raises questions of efficiency.

The issue comes down to the question of membership in the system. As Hirasawa (1992) states, "the more successful fisheries management cases appear, the more intractable question as to whom fisheries resources belong arises".

Theoretically, it is possible to resolve the conflict between equity and efficiency through monetary measures. Efficient systems, by definition, produce a surplus return; that is, an extra profit above and beyond that which is necessary to keep the fishermen active in the fishery. This surplus is a form of windfall gain resulting from the creation of the exclusive rights in the fishery, whether it accrues to individuals, as in the Philippine FADs, or to user groups, as in the Nemuro Bay scallop fishery. Without the TURF, the surplus profit could not be produced.

It is this surplus profit which, in other situations (eg. license limit schemes in Canada and Australia), has led to claims that the management measures lead to the creation of "clubs of millionaires" or, in the case of Nemuro Bay, to "certain criticisms and discontents as to its distribution formulae".

This surplus profit is a form of resource rent, and it can be maintained that the resource rent properly belongs to the resource owners rather than to those fortunate enough to have acquired the exclusive use rights. The extraction of that rent through taxes or user fees can produce a benefit to the resource owners. In theory, the benefit may be sufficient to quiet the criticism and make those who are excluded from access feel that they are better off by abiding by the rules than by breaking them achieving, thereby, stability (equity) in the system.

The resource owner can be society as a whole or it can be the local community adjacent to the resource. The choice will depend upon the characteristics of the resource and the resource users and also upon the interests and willingness of government to devolve authority to the local level.

In practice, the conflict between efficiency and equity in fisheries management is likely to remain a persistent problem. But the severity of the problem should not be over-emphasized. In spite of all the difficulties associated with territorial use rights, the rights at least prevent the total damages to all interests that result from free and open access.

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## **BANK EXPERIENCE IN COASTAL RESOURCE REHABILITATION AND MANAGEMENT IN THE PHILIPPINES**

by

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Manila**

### **ABSTRACT**

In recent years the Asian Development Bank has observed that the development policies of its developing member states are placing increasing emphasis upon the equitable distribution of the benefits arising from sectoral development. The Bank is therefore positively encouraging countries to pursue such equity objectives alongside programmes to promote efficiency and the sustainable use of fishery resources. In line with these principles, the Bank is funding, with co-financing from Japan, a Fisheries Sector Programme in the Philippines which relies heavily both in its planning and execution upon the support and participation of the fishermen themselves. The basic strategy of the Programme requires the promotion, organization and development of community-based initiatives under the guidance of the Department of Agriculture and the direct support of local government bodies and NGOs. The paper describes the major components of the Programme to be implemented over 1990/94, notably the strengthening of law enforcement, biological and ecological assessments, the creation of artificial reefs and fish sanctuaries and, above all, the organization and training of municipal fishermen into self-directing groups. Occupational diversification initiatives are seen as a very important element in reducing pressure upon the resources. The Programme has already had a discernable impact, not only in resource regeneration and rehabilitation, but especially in mobilizing enthusiasm and participation among the fishing communities for the policy's principles and objectives.

### **Principles and Policies of Bank Assistance to the Fisheries Sector**

1. The Bank's policy for fisheries sector assistance to developing member countries (DMCs) is guided by five main principles: (i) productivity; (ii) sustainability; (iii) efficiency; (iv) equity; and (v) beneficiary participation in project planning and implementation. In recent years, a general shift in emphasis in development policy of DMCs has been observed: sectoral development strategies have underscored the urgency of ensuring that benefits are equitably distributed, and particularly meet the income, employment and nutritional requirements of the poor. The results of production-oriented development of the fishery resources as common property caused, in many areas, environmental degradation and drove fishermen and fish farmers further into destructive patterns of resource use, imposing greater hardship on the poorest groups. In its future strategy for fisheries development of DMCs, the Bank thus sees increased opportunities to make a positive impact on these various dimensions of fisheries development by encouraging DMCs to pursue equity objectives



alongside productive efficiency and sustainable and indestructive use of fishery resources and the environment. In line with the principles and policies of Bank assistance to the fisheries sector, a Fisheries Sector Programme was initiated in the Philippines.

### **Philippine Fisheries Sector Programme**

2. On 26 September 1989 the Bank approved two loans for a Fisheries Sector Programme in the Philippines in an amount equivalent to \$50 million from special Funds and \$30 million from ordinary capital resources. The Overseas Economic Cooperation Fund (OECF) of Japan agreed to co-finance the Programme in an amount equivalent to \$70 million.

### **Background**

3. The coastal zone, with its coral reefs, mangrove forests and coastal shelf, is biologically the Philippines' most productive marine environment. It provides over 75 percent of the country's fisheries harvest. However, the coastal zone has been under intense pressure from overfishing. It is estimated that the fishing effort for small pelagic fish is double that which would ensure resource sustainability. The near-shore demersal stock is estimated at only 30 percent of the levels existing during the 1940s. Less than 20 percent of the 270,000 ha of shallow water coral reefs (0-20 fathoms) remains in good to excellent condition. Destructive fishing techniques employing dynamite, cyanide, and muro-ami netting<sup>3</sup> have all contributed to the destruction of coral reefs. The destruction has been further exacerbated by increased sedimentation from deforestation, dumping of mine tailings, dredging, coral mining for construction activities, and coral harvesting for the curio trade.

As to mangroves, it is estimated that of the 400,000 - 500,000 ha in the 1920s, only some 200,000 ha remain, of which only about 20,000 ha remain in virgin stands.

4. The Government's policy and commitment to the management and conservation of fisheries resources on a sustainable basis was expressed in its 3 August 1989 Statement that the general objectives of the 1990-1994 coastal fisheries would be resource regeneration, environmental habilitation, balancing of fishing effort to achieve maximum sustainable yield, control of destructive fishing activities and the alleviation of poverty among municipal fisherfolk, particularly through income-generating activities.

5. A series of policy and institutional reforms were agreed that covered the following areas: (i) enactment of appropriate laws, particularly over local and municipal waters; (ii) development of the necessary database for coastal resource management through detailed stock assessments; (iii) establishment of a rational licensing system that would be gear and area-specific, and would also be related to maximum sustainable yield (MSY); (iv)

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<sup>3</sup> A highly destructive fishing method that uses a long (3 km) net into which fish are scared by a line of swimmers pounding coral reefs with rocks attached to scarelines. Muro-ami -- criticized on social grounds because it employs young children, living in cramped conditions on poorly maintained boats, as cheap labour to net fish - was declared illegal in 1986.

improvement in law enforcement, especially control of destructive fishing methods; and (v) alleviation of poverty among municipal fishermen as a long-term measure to decrease fishing pressure on coastal waters.

### **Components of the Programme**

6. The Programme consists of six components to be implemented during 1990-94. The Coastal Resource Management Programme (CRMP) is the core of the resource and environmental rehabilitation thrust of the programme. The basic implementation strategy for CRMP will require the promotion and development of community-based initiatives in resource management under the technical guidance of the Department of Agriculture (DA). Fishermen will be organized and trained by both the Government and Non-Government Organization (NGOs) to undertake resource enhancement measures such as the establishment of fish sanctuaries and marine reserves, construction of artificial reefs and reforestation of mangrove areas. Alternative livelihood projects will be developed to draw fishermen away from fishing into other economic activities, thereby easing the pressure on fisheries resources.

7. The effective protection of marine resources in the Philippines requires decentralized law enforcement, organized and based in individual fishing communities. Thus, the law enforcement component will provide training and logistical support to community-based task forces composed not only of local police and Government personnel, but more important, of the fishermen themselves. The credit component will support income diversification projects for small-scale fisheries.

8. The Programme will be implemented in 12 of the country's 26 priority fishing areas (see below).

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Priority Fishing Area	Provinces
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Manila Bay	Metro Manila, Cavite, Papanga, Bulacan, Bataan
Calauag Bay	Quezon
San Miguel Bay	Camarines Sur, Camarines Norte
Tayabas Bay	Quezon
Ragay Gulf	Quezon, Camarines Sur
Lagonoy Gulf	Camarines Sur, Albay, Catanduanes
Sorsogon Bay	Sorsogon
Carigara Bay	Leyte
San Pedro Bay	Samar, Leyte
Ormoc Bay	Leyte
Sogod Bay	Southern Leyte
Panguil Bay	Misamis Occidental, Lanao del Norte, Zamboanga del Sur

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The 12 priority bays were selected based on the following criteria: (i) resource regeneration requirements; (ii) environmental degradation problems; (iii) poverty levels of

fishing communities; and (iv) initiatives in self-regulation by municipal governments and local fishermen.

9. Overall coordination and monitoring of the programme is being undertaken by the Programme Management Office (PMO) established by the Executing Agency, DA, which has also designated a Special Assistant for Fisheries Development (SAFD) in each Region where the Programme is being implemented. The provincial operations of DA have been realigned to include Provincial Fisheries Management Units (PFMUs), which have assumed the role of provincial Programme management offices.

#### **The Coastal Resources Management Programme**

10. The heart of the Programme is the Coastal Resources Management Programme (CRMP). In many areas where the unrestrained exploitation and conflicting interests of resource users have posed serious threats to the sustainability of the resource base, the community-based resource management approach has been considered the most effective method for restoring stability and economic order in utilization of the resources of the coastal strip. The Programme underscores the importance of fisherfolk participation in the decision making process and the transformation in their attitudes from mere users to resource managers. The principal intention of the CRMP is to facilitate the conduct of resource and related ecological studies; community organization and participation in resource management; resource enhancement programmes such as the establishment of ARs, mangrove plantations and fish sanctuaries; and implementation of diversified livelihood projects that will eventually reduce fishing effort in the bays. The implementation approaches for the activities under the CRMP are spelled out in a CRM Plan, which will contain the following information: (i) management plan objectives; (ii) profiles relevant for resource management (environment, resources, socio-economic analyses); (iii) resource management problems and their causes; and (iv) recommendations for future resource management policies.

11. The following paragraphs describe the current status of activities associated with the CRM Plans.

##### **(a) Law Enforcement**

12. In recognition of the serious problems of overfishing and destructive harvesting activities along the coastal fishing areas, the Government has given significant political and financial support to law enforcement efforts. The Presidential Committee on anti-Illegal Fishing and Marine Conservation was created in 1989 together with the adoption of the Bantay Dagat ("Guard the Sea") programme. Under the Programme, law enforcement activities in the priority fishing areas have been greatly strengthened. Initially, leaflets and posters were distributed, and anti-illegal fishing campaigns carried out through local radio stations. By June 1991, the programme had financed the procurement and deployment of 16 motorized vessels with communication facilities for patrolling municipal waters in the three priority fishing bays. In addition to patrol boats, PFMUs have deputized about 395 LGU officials and fishermen leaders as fish wardens (120 in Calauag Bay, 200 in Carigara Bay, and 75 in Panguil Bay) with powers of arrest. A measure of the vigilance of the community and the local government in law enforcement is indicated by the number of apprehensions made thus far: Calauag Bay - 40; Carigara Bay - 21; and Panguil Bay - 43. The most impressive achievement has taken place in Panguil Bay, where the Programme provided the

impetus for dismantling about 1,400 illegal sanggabs (filter nets) and confiscating 276 gill nets and scissor nets. The Government had already approved the closure of two bays (Lamon Bay and Manila Bay) to ease fishing pressure and reduce competition between the small-scale and commercial fishermen. Carigara Bay is to be closed to commercial fishing. Although the law enforcement component is being undertaken effectively, there are still some areas of concern, such as (i) inadequate resolution of cases by the judiciary at the provincial and municipal levels, and (ii) insufficient knowledge of legal procedures (e.g. filing cases, submission of evidence, identification of illegal fishing gear, etc.) not only among fishermen, but also local government officials.

(b) The Coastal Resources Management Plan

13. The CRM Plans have been developed for three priority bays<sup>4</sup> based on the outputs of the Resource and Ecological Assessment and through extensive consultations with fishermen's associations, local government officials, and scientific personnel, from both Government and research institutes. The CRM Plans will be updated periodically and refined as more information, data, and analysis become available from the detailed REAs and future long-term resource monitoring and assessment.

(c) Community Organization

14. The role of NGOs under the programme is to organize the municipal fishermen into self-directing groups that with appropriate technical training will be able to undertake community-based programmes for self-regulation, resource management, and income diversification. The overall objective will be for such groups to become effective partners in implementation of the coastal resource management plans in the 12 bays under the Programme. The NGOs will be critical in explaining to the fishermen and their communities the nature, objectives, and relevance of coastal resource management, and the important role to be played by them in the implementation of coastal resource management plans. The NGO work plan will cover two years and be divided into two phases. The first phase, a one-year period, will be devoted to developing barangay level fishermen's organizations or associations to undertake coastal resource management and conservation, conflict resolution, enforcement and regulation, and initiating a community-led and community-based integrated CRMP. Phase II will ensure the viability and sustainability of the community organizations through organization support, introduction and promotion of livelihood projects and implementation of CRM Plans.

(d) Artificial Reefs, Fish Sanctuaries, and Mangroves

15. Artificial reefs (ARs) are being promoted under the Programme as efficient fishery management tools. The establishment of ARs is not only for fish catch improvement as fish aggregating devices, but also for fish habitat rehabilitation by providing space for juvenile fish recruitment, as well as promoting fish growth and biomass accumulation. Under the close supervision of BFAR technical staff, 364 AR modules have so far been constructed and installed by fishermen's associations. It has been reported by fishermen that some Programme-funded ARs in Panguil and Calauag Bays have already attracted commercially

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<sup>4</sup> Panguil Bay; Carigara Bay; and Calauag Bay.

important fish species, such as groupers, mullets, siganids and lutjanids, and that the average fish catch by small-scale fishermen using hook and line (the only gear permissible under current management guidelines; also the most conservative fishing gear) around a few AR areas has increased from 2 Kg/day in 1990 to 4-5 kg/day in 1991 for high value species. Currently, discussions are being held with the fishing communities on the possibility of banning fishing in the AR areas during the fish spawning season from April to June, and to restrict fishing gear in areas adjacent to the ARs.

16. A fish sanctuary can also be an effective fisheries resources management tool. It is invaluable as a protected water area where fish are able to spawn, feed, and grow without hindrance. The establishment of fish sanctuaries in the three priority fishing areas under the Programme has followed a process similar to the ARs. The sites were selected on the basis of scientific assessment and extensive discussions with the communities whose fishing grounds would be restricted. Community participation is a critical factor as management and protection of such large areas is complex. To date, six fish sanctuaries have been established in the priority bays with another in Panguil Bay due to be approved soon. The impact of the fish sanctuaries on resource regeneration will be scientifically evaluated by June 1993, a date that approximates the completion of the first reproduction cycle.

17. Mangroves represent a valuable, renewable commodity for coastal communities; they are the breeding, nursery and feeding grounds for many species of shrimp, crab, and fish, which provide a source of both protein and income. Mangroves are extensively used for firewood and for the construction of houses and fishtraps; they also act as sediment traps, helping to protect coral reefs. The production of mangrove litter plays an important role as a foodbase for coastal fisheries. As much as 98 percent of primary productivity in mangrove coastal waters is derived from mangrove litter. The loss of mangrove forests to fishponds over the past few decades has been a major cause of reduced fisheries in municipal waters and the depletion of larvae and juvenile aquatic species. DENR would have the responsibility for executing the component through its Coastal Resources Management Committee. To date, 3,750 ha have been planted and rehabilitated through NGOs and family-based contracts.

### **Occupational Diversification Programme**

18. About 700,000 small-scale fishermen are involved mostly in protected bays and about 80 percent have incomes below the poverty line of P2,650 per month. As these coastal regions have poor labour absorption in industry and commerce, the marginal fishermen have had few options other than fishing, which with increasing population has placed greater pressure on the coastal fisheries resources. The long-term strategy to ease pressure on fisheries resource is to draw labour away from fishing by making available alternative livelihood in coastal areas. Such alternative livelihood could either supplement income from fishing, especially during off-season months, or replace fishing altogether as the primary source of income. The Programme has, therefore, introduced an occupational diversification programme into the three priority Bays providing technical assistance and micro-credit to fishing families.

19. The occupational diversification programme consists of a financial stream to fund alternative livelihood projects in all the priority areas and an organizational stream requiring NGOs to mobilize, train and monitor communities in the fishing Bays. The financial stream

will operate through credit channelled through participating financial institutions and technical assistance, credit, and grants through existing Government programmes; both will finance the same range of alternative livelihood activities. The credit needs of marginal fishermen must be distinguished from those of established fishfarmers, who have access to larger credit amounts from GFSME-accredited financial institutions. In the case of marginal fishermen, a major policy consideration is the repossession of under-utilized or illegal fishponds for redistribution to organized fishermen's association for fish/prawn cultivation. Although there will be equitable access to alternative livelihood project financing and adequate marketing support, the objectives of the Programme make it imperative that fishermen directly dislocated by Programme policies (fish sanctuaries, ban on gear, etc.) be provided immediately with alternative sources of income and adequate credit facilities. A diagrammatic presentation of credit flows and possible alternative livelihood activities is shown in the Appendix.

20. Because small-scale fishermen in general have no assets and are dispersed throughout remote fishing villages, they require flexible collateral and group-based credit for such income diversification projects. The Programme has identified the credit conduits for loans to support income diversification projects to be LBP under its Integrated Rural Financing (IRF) Programme; PCIC, through its guarantee system; and DBP, through its socialized Lending Window, all of which will charge interest rates of 13-15 percent. The amounts provided by the Programme thus far are P 40 million (LBP); P 30 million (DBP). The largest conduit, IRF, is an existing special lending programme of the DA-LBP established in 1987 as the loan window for the Consolidated Agricultural Loan Fund (CALF), comprising Masagana 99 (rice), Masaganang Maison (corn), Masaganang Bakahan (cattle), and Biyayang Dagat (fisheries). With 206 barangays in the three priority bays, an average of 27 families per barangay have received technical and financial support under the programme's occupational diversification programme.

### **Overall Impact of the Programme**

21. As a policy-based instrument for change, the impact of the Programme will not be distinctly perceptible for some time. The structural changes in institutional and sectoral policies involve a long-term process of shifting from exploitation of resources to resource management, from Government direction to community-led initiatives, from discrete sector projects to national fisheries management and from uncoordinated sectoral leadership in disparate Government agencies to national strategies administered by a unified bureaucracy. The process of change involves not only central government policies, but reaches down to the very basic unit of development, the community itself.

22. However, certain developments have already occurred and are quite remarkable compared with the earlier situation; these include the extent and form of community mobilization, the response and increasing role of local governments and rationalization of the fisheries administration. The following paragraphs briefly highlight the changes brought about by the Programme in those areas, as well as in resource regeneration.

#### **(a) Community Mobilization**

23. The Programme's policy and structural reforms are based on the premise that resource management is feasible only if the responsibility for regeneration, conservation, and sustained

management of fisheries resources is shared between the Government and the direct beneficiaries of the resource, i.e., the fishermen and their immediate communities. However, the prime mover in resource management must be the community. The NGOs are the focal point of efforts to organize the small-scale fishermen into the operational arms of the coastal resource management plans. Prior to the Programme, the few NGOs involved with municipal fishermen were concerned more with advocacy, political representation, and general community development than long-term development needs.

24. The Programme has maintained a very high degree of community participation, having generated tremendous enthusiasm in both fishing barangays affected by resource depletion and provinces that recognize the long-term benefits of resource management. The effectiveness of community involvement in managing coastal resources has been fully demonstrated in the three priority Bays. In Panguil Bay, the impetus for the ban and removal of some 1,400 sanggabs (filter nets) supporting 35,000 persons would not have been possible without active community support of the initiatives of the Panguil Bay Development Council (PBDC). The communities have accepted a ban on new fish corrals and are even being persuaded that the number of corrals should be reduced. In the case of Calauag Bay, part of the larger Lamon Bay, the efforts by Bigkis-Lakas-ALQUERIZ, a fishermen's association, and Family Center-Asian Council Institute (FC-ASI, an NGO) led to the closure of the Bay under FAO 165 (1989) to commercial fishing vessels and boats of any size using buli-buli. However, the closure itself would have meant little without the active implementation of community-based law enforcement efforts and local government support through the Programme. In Calauag Bay, the fishermen monitor illegal fishing activities using Programme-funded patrol boats. Fishermen have reported that catches have increased three-fold in some parts of the Bay. The impact of community involvement in the closure of Calauag Bay has spilled over to Tayabas Bay and Ragay Gulf, where LGUs are under tremendous pressure from local fishermen to enforce at least the 7-km ban against commercial fishing and to step up law enforcement against illegal dynamite fishing. A different type of initiative at the municipal level may be seen in Babatngon, Leyte, where under the leadership of the Mayor, the community has developed a Babatngon Integrated Agricultural Community Programme (BIACP), for which technical and financial support is being made available under the Programme. Under BIACP, a 25-hectare parcel of foreclosed land available for distribution under the Comprehensive Agrarian Reform Programme (CARP) has been identified as a site for different livelihood projects and agricultural support facilities to serve "displaced" fishermen. The BIACP would include a feed mill, livestock and foodcrop activities, and housing. In Carigara Bay, most of the barangay and municipal resolutions required for the closure of the Bay to commercial fishing have been approved. It is expected that the closure of Carigara Bay will be in effect by the third quarter of 1991. This development has been a direct consequence of community mobilization and increased resource management awareness brought about by the Programme.

#### (b) Resource Regeneration

25. With the stricter implementation of fisheries laws supported by the Programme, reports from LGUs and fishermen indicate that the extent of illegal fishing has been reduced by 60-70 percent overall in the three priority Bays. Resource regeneration should soon become apparent with stricter enforcement of laws and programme-initiated resource management activities. There are some signs that these efforts are already proving

successful. For example, with the banning of certain gear in Panguil Bay, seven species of fish have reappeared, including mullet and siganids, and the catch of anchovies and estuarine shrimp has increased two-fold. Fishermen in Apad Bay, a small inlet in Calauag Bay, have reported perceptible increases in grouper fry population. During the previous peak season (October to December 1990), catches were reported to be as high as 1,000 fry from one night of fishing.

## Conclusion

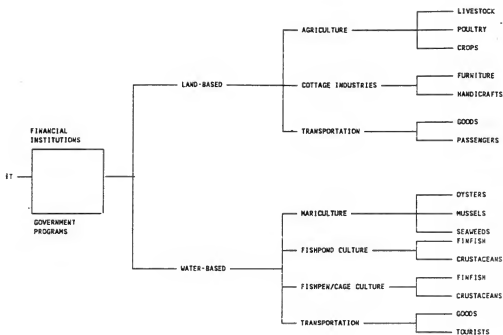
26. The Philippines has been endowed with exceptional maritime resources: 30,000 km of coastline deeply indented with numerous gulfs and bays, 240,000,000 ha of marine waters and about 815,000 ha of inland waters, supporting some 2,000 species of fish that represent some 60 percent of the animal protein source of the nation. Despite such an enviable position, the fisheries sector has been, in effect, a quiet victim of progress. Increasing population pressure, unrelenting exploitation of coastal resources, pollution and siltation, and lack of administrative oversight at all levels of government led to a situation in which nothing short of a major sectoral overhaul could have been acceptable. The Programme was formulated as a response to this need, with a detailed schedule of actions intended to restore sustainable resource levels.

27. The Programme represents the first major attempt to apply a relatively new concept in the sector, resource management, to not only restructure and rationalize fisheries administration, but also to create among the resource users, fishing communities, an ideology of change based on a heightened awareness of their responsibilities and rights over coastal waters and participation in management planning for a future that the communities themselves would determine. Together with revitalization of offshore fishing efforts, the Programme represents a total approach to the sector, the resurgence of which will require support not only over the Programme's legally-defined life of five years, but beyond as part of a sustained national fisheries development policy.

28. Since its initiation in 1989, the Programme has made significant achievements, not so much in tangible quantifiable terms such as increased fish catches or income and employment levels, but in the more fundamental process of laying the foundations for inducing sectoral change. This has been demonstrated by the tremendous response from both the bureaucracy and the communities to the idea of resource management and rehabilitation. The Government agencies concerned have rediscovered a purpose and the fishing communities have reoriented their priorities. The Programme is fully underway in the three priority Bays, with activities being initiated in the remaining nine bays. Given the present pace of implementation, it is expected that the overall objectives of the Programme will be achieved.



Appendix 1



## NEW ZEALAND'S INDIVIDUAL TRANSFER QUOTA SYSTEM FOR FISHERIES MANAGEMENT<sup>5</sup>

by

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### ABSTRACT

Prior to its declaration of a 200 mile Economic Zone in 1978, the New Zealand government followed a policy of open access to its fish resources. Boosted by capital grants, allowances and other fiscal incentives, there was a rapid increase in investment in the industry and a danger of over capitalization. Extended national jurisdiction allied with a growing realisation that economic as well as biological objectives were needed to achieve more effective fisheries management led to the introduction in 1983 of a new management regime based on individual transferable quotas (ITQ) for the deepwater fisheries and in 1986 for the inshore sector. Reporting mechanisms were created to administer this new quota-based system of management and the traditional "at sea" surveillance and enforcement was replaced by a mechanism based upon monitoring the flow of products through the distribution system. The subsequent assignment of special Maori fishing rights and other attendant issues led to the change in 1990 from denominating ITQ as a specified tonnage of quota to a percentage of TAC. These developments provoked discord between industry and government, partly with regard to the amount of compensation received by industry but also because of growing concern over the increasing complexity and bureaucracy of the fisheries management administration. A number of other issues including restructuring, resource rentals and exploratory fishing policy, also required resolution. Therefore, although there is agreement that the ITQ system must remain the cornerstone of New Zealand fisheries management, an examination is now being undertaken of options for greater efficiency and simplicity in administering the system and, in particular, of placing greater responsibility for management in the hands of the users of the resources.

### Introduction

This paper describes the status of the New Zealand Quota Management System and examines some of the significant issues facing the system, the industry it operates in and the fisheries management administration.

New Zealand is a small economy with high dependence on export activity and is therefore vulnerable to commodity price movement, international business cycle downturns

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<sup>5</sup> This is an edited version of a paper presented at the JIFRS/IIFET/ZENGYOREN Symposium on Fishery Management, Tokyo, 1991

and exchange rate changes. It is primarily agriculture based, largely dependent on the production and export of sheep meats, beef, wool and dairy products.

Until very recently New Zealand's economy has been afflicted with a high level of inflation which, coupled with a downturn in international markets for agricultural products, high levels of trade barriers and protectionist policies by most developed countries and increased oil prices has reduced economic growth opportunities. New Zealand has incurred a very high level of foreign debt as well as a high internal deficit and has faced a declining standard of living in comparison with other OECD member countries, poor productivity and rising unemployment.

The Government's response has been to follow a free market approach, reducing border protection, deregulating the financial and labour sectors, removing agricultural assistance measures, removing exchange controls and allowing the New Zealand dollar to float, and reducing Government funding of social services and welfare.

### The Fisheries

New Zealand's 200 mile EEZ is some 1.3 million square nautical miles or more than 15 times its land mass. While the zone is very large (fifth largest in the world), it is not, by world fishery standards, very productive, having only a very narrow continental shelf with 72% of the zone having water deeper than 100 metres.

The value of production in the fishing industry increased from NZ \$541m in 1984 to approximately NZ \$900 m in 1990. It is estimated that there is an available fishing resource of some 700,000 tonnes of which a little under 600,000 tonnes is subject to the Quota Management System (QMS).

Production is forecast to decline from an estimated high of 614,000 tonnes in 1989 to about 550,000 tonnes by 1994, a decrease of around 12%. Reductions in orange roughy and hoki quotas are expected to be partially offset by higher harvests in other fisheries and through expanding production from aquaculture. About half of the total catch is taken by foreign vessels under charter to New Zealand fishing enterprises.

Of total production, some 80% is exported. New Zealand's domestic market is limited and domestic sales have remained relatively static over time. Japan, the United States and Australia are New Zealand's major export markets; in 1990 they accounted for 80 percent by value and 76 percent by volume of all fishery exports. Orange roughy, worth \$145m, is the most valuable species exported. Squid earned \$62m and rock lobster amounted to \$84.0m. Together those three species accounted for over 40 percent of total exports. Other key products are snapper (\$49m), surimi (\$20m), processed mainly from hoki, hoki products such as fillets and headed and gutted fish (\$69), mussels (\$34m), oreo dory (\$19m), barracuda (\$16m) and warehou (\$19m). It is interesting to note that exports in 1970 amounted to \$NZ17.3 and in 1980 to \$NZ163.4m and in 1990 \$NZ749m.

Investment patterns in the industry have followed the expansion that took place following the declaration of the EEZ with the development of the deepwater fisheries demanding additional catching and processing facilities. Investment in the catching sector is estimated to have increased by \$65 between 1984 and 1990 while investment in processing

capacity increased by over \$100m in same period. Over the same period, total jobs in the fishing industry increased by some 3,000.

### Fisheries Management prior to the QMS

Before the declaration of the 200 mile New Zealand Exclusive Economic Zone (EEZ) in 1978, the fisheries were small and confined to an inshore domestic industry operating to a depth of approximately 200 metres which is effectively the near Continental shelf. New Zealand jurisdiction initially extended to three miles and then to 12 miles. Beyond this the fisheries were exploited by foreign fishing vessels from Japan, Korea and the Soviet Union.

The management of the fisheries during this period was often confused by major fundamental changes. For instance, from 1938 until 1963 the inshore fishery was managed under a restrictive licensing system with extensive gear and area control, whereby boats were required to fish from nominated ports. In 1963 the inshore fishery was completely deregulated and remained that way until 1978 when a moratorium on the issuing of rock lobster permits and scallop permits was imposed, followed by, in 1980, the introduction of a moratorium on further wetfish permits.

During this period of open entry, it was the New Zealand Government's policy to encourage investment in the fishing industry through capital grants, allowances and tax breaks. The rapid expansion of the domestic industry during this period laid the foundations for its further development into the deepwater fishery following the declaration of the 200 mile zone. This open access situation inevitably encouraged the natural tendency towards overcapitalization. Economic objectives still remained unfocused even after the introduction of controls in 1978 and 1980, the controls in 1978 being limited to the rock lobster fishery. While these controls limited entry, they did not in any way restrict increases in effort which continued apace. In the rock lobster fishery, numbers of separately managed limited entry controlled fisheries were established by rationing non-transferable licences through a licensing authority. However, the investment in the fishery was not reduced as a result of the new policy even though economic objectives were cited as the reason for the limited entry to the fishery. Administrative problems, particularly with non-transferability and increased effort and investment in this fishery, have led to calls from the industry itself for a review of management. A proposal to bring this fishery into the quota-controlled fishery is now being discussed with the industry.

The declaration of the 200 mile zone added an impetus to the need to clarify objectives through appropriate management approaches. Initially, the Government chose to manage the EEZ and the inshore fisheries as separate entities, applying to the zone outside 12 miles a policy of limited domestic expansion, joint venture arrangements and foreign licensed nation fishing. To a large measure, this policy reflected wider trading arrangements with those who had traditionally fished beyond the 12 mile limit where the resources were already heavily exploited by those nations, thus restricting opportunities for immediate expansion of domestic activities.

### The Quota Management System

A new piece of legislation, the Fisheries Act, was passed in 1983. At the same time, the Government introduced an economics-based management system for the deepwater

fisheries based on individual company transferable quotas. Moreover, major economic and biological problems in the inshore fishery became such that they could no longer be ignored.

The Fisheries Act 1983 consolidated previous legislation and introduced the concept of fisheries management plans. It did not directly address the fundamental question of how or by what criteria fisheries were managed and still relied heavily on the preservation and conservation philosophies with all their attendant regulatory control requirements. However, for the first time in New Zealand fishing history, recognition was given in the Act to a wider range of objectives rather than just conservation and among these was the concept of an optimum return from the fishery - which inevitably embraced economic goals beyond the short-term financial goals of participants.

The deepwater trawl policy introduced under this Act recognized the need for management to be economics-orientated and relied heavily on managing the resources by controls on output rather than by inefficient input controls. The biological and economic problems in the inshore fishery focused attention on the inability of traditional management methods to deal with the new situation and emphasized the need to examine alternative fisheries management methods and concepts.

These events led to the integration of economic objectives and strategies into overall management programmes and finally in 1986 to a further amendment to the Fisheries Act which recognized the importance of economic goals in the management of fisheries and provided for the introduction of the Individual Transferable Quota (ITQ) system in the inshore fishery and its more comprehensive application to the deepwater fishery. The essential element of the new policies that have developed since 1983 is the creation of property rights. The tradeability of these quotas, the reduction of intervention by the Government (relying upon market forces rather than regulatory interference) and the matching of effort to the resource permit the industry to develop with inbuilt economic efficiency while maximizing returns to the nation through resource rentals and increased profitability and competitiveness.

The ITQ policy now covers all commercially significant finfish species in the zone with the exception of tunas. In addition, in 1989, rock lobster were incorporated into the system which the Government has confirmed as the fundamental mechanism through which fisheries in New Zealand will be managed.

#### The Individual Transferable Quota Mechanism

The ITQ is a transferable property right allocated to fishermen in the form of a right to harvest surplus production from stocks. Currently, 29 species are covered by ITQs (21 inshore and eight deepwater species).

The system by which quotas are managed is based on certain basic documents: the Catch Effort and Landing Return (CLR), the Catch Landing Return (CLR), the Licensed Fish Receiver's Return (LFRR), and the Quota Management Report (QMR). These documents are used to generate information about catching activity and use of harvesting rights; they also provide detailed catch/effort data.

The skipper of a fishing vessel must complete the Catch Landing Return immediately a catch is landed. The CLR provides an 'on site' record of catch landing activity. The return does not have to be forwarded at regular intervals to a Registrar but must be available on demand to any Fisheries Officer or examiner. It may be used to verify the reports of both Quota Holders (QMR) and Licensed Fish Receivers (LFRR). A Catch Effort Landing Return is also required for each fishing method and provides detailed information to assist in the scientific stock assessment programme.

The return provides the following information on fish species landed:

- i) date
- ii) species/area
- iii) state, e.g., green, gutted, filleted
- iv) number/container
- v) fisherman's identification number (FIN) (Quota Registration No. against which the fish is caught)
- vi) destination by Licensed Fish Receiver Number or vessel registration number
- vii) greenweight, and
- viii) purchase tax invoice from LFR.

The Licensed Fish Receiver's Return (LFRR) is completed by all those licensed to receive fish from commercial fishermen. Returns must be submitted to a Registration Office monthly, or at a shorter interval if specified. The Return shows, for fish received, the quota holder's name and FIN, the species and the greenweights.

All those receiving fish from commercial fishermen must hold Fish Receiving Licenses. Licensed fish receivers must report by way of a LFRR in a similar way to fish quota holders, i.e. monthly, or shorter intervals if specified. The LFRR is designed to monitor commercial fish receiving operations beyond the landing point. It provides a means of cross checking QMRs and vice versa. It makes receivers as responsible as fishermen and quota holders in monitoring the use of the resource.

Accounting, auditing and financial analysis skills are employed to ensure that fish receivers report their purchases correctly. The LFRR shows the quota holder's name and FIN, species and greenweights of all fish species received.

A fish receiver is defined as any person who receives fish from a commercial fisherman for handling or processing other than in the case of small boat-side sales. It is an offence for an unlicensed person to receive fish from a commercial fisherman. Fish export licenses and fish packing house licences can be recognized as fish receivers' licenses.

A license or certificate of registration may be declined, revoked or not renewed if the applicant or any person involved in the management of the operations has been convicted of any fishery offence or has been involved in the management of a corporate body that has been convicted of a fishery offence.

The Quota Management Report (QMR) is completed by the holder of quota. It must be submitted to a Registration Office monthly, or at shorter intervals if specified and a fisher must hold for at least three years supporting documentation, e.g. invoices, dockets for receivers, etc. The Report details the quantity of fish caught during the period covered for each species by area, for which quota is held. It is the basic document for the monitoring of harvesting rights. Information on fish caught can be checked against Licensed Fish Receiver Returns and Catch Landing Reports and other documentation. The information contained in the QMRs can be checked against that from the LFRR and vice versa and the CLR can be employed to verify both of these reports.

### Enforcement

Prior to the introduction of the QMS, the enforcement approach in New Zealand's fisheries management policies was of the traditional "game warden" type. The objective of this type of system is simply to apprehend people who are breaking the law and to provide a presence in an attempt to reduce the incidence of offending. The emphasis in a traditional enforcement activity is on the physical appending of wrong-doers.

The introduction of the QMS changed the nature of focus of the enforcement activity. The QMS gave the enforcement authority the opportunity to move away from a people management enforcement approach to one based on monitoring the flow of product and the resource generated from the product flow.

The role of the enforcement arm is now one of product flow control from fishing vessel to retail disposal. It does not chase people - it monitors the distribution chain of the product. It does not monitor the actual fish but seeks to establish a "paper trail" which can be followed. The enforcement focus is now "on land" rather than the traditional surveillance and policing role at sea. In short, the movement has been from game warden to auditor.

There is, however, still a substantial role for enforcement in two traditional areas, i.e. poaching or deliberate illegal fishing and the policing of the recreational or amateur fishery. Both these functions still require physical monitoring, surveillance and enforcement.

Current developments in enforcement in New Zealand relate to the use of new technology such as satellite surveillance which is more cost-effective than physical surveillance by the airforce or navy and technological improvements in data handling and analysis. The key to compliance is information and the more timely and detailed the information available the better the enforcement function can be performed.

### Maori Fishing Rights

The development and implementation phase of the QMS assumed that the position of the Maori people and their interaction with the fisheries would be unaffected by the new system. However, this was not the perception of some New Zealand Courts nor of some of

the Maori people and considerable conflict arose. The disputes originate in the provisions of the Treaty of Waitangi signed in 1940 between the Crown and Maori. Long and complex negotiations on this issue culminated in the passing of the Maori Fisheries Act in 1989.

The Maori Fisheries Act, *inter alia*, provides for the creation of a Maori Fisheries Commission to whom 10% of all TACs is to be transferred over a four year period. The Act also grants the Commission a sum of \$NZ10m and establishes its function to encourage and assist Maori to get into the business and activity of fishing. An important element in this agreement is that any species incorporated into the QMS in future will have the quota so created limited in term to 25 years. It will in effect be Transferable Term Quota (TTQ) rather than ITQ in perpetuity.

The Maori "solution" raises two outstanding issues of concern to the commercial industry. The first relates directly to the term of quota and the destabilizing effects a limited term has on commercial decision-making, coupled with a worry that Maori will press to have existing perpetuity ITQs converted to fixed term TTQs. Industry requires secure access rights if it is to plan, expand, invest in, and develop the fisheries resource.

The second issue of major concern relates to the transfer of Government-owned quota to Maori, to meet its obligations under the Maori Fisheries Act, rather than applying this quota to reduce TACs. Under such circumstances, the burden of TAC reductions falls proportionally more heavily on the commercial fishing industry.

#### The Move to Proportional ITQs

Another important and contentious development, with a number of attendant issues, was the change from denominating ITQ as a specified tonnage of quota to denominating it as a percentage of the TAC.

The QMS was based on allocating specific tonnages of quota to quota holders. Each quota was determined on the basis of historical catch or some other measures of commitment to and involvement in the fishery.

Under the existing legislation any Total Allowable Catch (TAC) adjustment was to be affected by the Government entering the market and buying or selling quota. There is a provision for prorating TAC reductions where the Government is unsuccessful in acquiring sufficient quota.

At the time the allocation policy was introduced in the deepwater trawl fishery in 1983 and then subsequently expanded and introduced in the inshore fishery in 1986, the TACs, as set, were considered likely to be conservative and it was thought that further research could well lead to increases in TACs. For this reason it was judged that the Government should retain the opportunity of possible substantial gains from the sale of increased quota.

Furthermore, it was argued that the industry needed certainty of quota holdings to facilitate development and investment and that Government needed information on trading prices to assist in setting resource rentals. In addition, at the time of implementing the Individual Transferable Quota system, the Government paid \$50 million to the industry to



reduce catching effort in stressed fisheries. It was considered that these stocks would recover and the Government would be able to recoup its investment by disposing of the ITQ that then became available.

However, in early 1989 it was becoming clear that a number of fish stocks were facing future TAC reductions. These included snapper, warehou, bluenose, alfonsino and, most importantly of all, orange roughy. It was the orange roughy reduction that was to become the driving force behind the move to proportional quotas. If there were to be a substantial orange roughy TAC reduction which could involve a very substantial pay out, then in the short term at least the Government would benefit from not being the bearer of the primary risk.

The Government then entered into negotiations with the New Zealand fishing industry to find an acceptable means of moving to a proportional ITQ/TAC system. While initially opposed to the proposal, the industry agreed to consider such a move but was insistent that some degree of compensation should be paid by the Government for effectively changing the nature of the property right enjoyed by the industry to that point. It was also important that at this time the industry was aware that the Government was considering significant quota reductions in key species.

Out of the negotiations over proportional quotas there emerged a Memorandum of Understanding (MOU) between Government and industry, the principles of which were legislated for in the Fisheries Amendment Act 1990.

The Act provides, *inter alia*, that TAC reductions are to be compensated for, at agreed values, out of resource rentals paid by industry over a five year transitional period ending 30 September 1994 plus a swap arrangement involving half the Crown squid quota holding (at that time over 50,000 tonnes). Following this transition period, no compensation would be paid for any TAC reductions. In addition, any hoki TAC reduction above a certain figure triggered an extension of up to three years in the transitional period. It was also agreed that resource rental increases during the transition period would not be increased by more than the percentage movement in the Consumer Price Index in the immediately preceding June year. It was also agreed that the Government would cancel its quota holdings in the event of a TAC reduction as the first measure.

Industry accepted the transfer of the risk of fishery management in exchange for this degree of compensation for expected reductions of quotas. At the final agreement on the MOU, the industry representatives were of the view that the compensation arrangement arrived at would compensate for the market value of any TAC reductions. At the same time, the principal issue was orange roughy. Subsequently, additional proposed TAC reductions, a decline in resource rental forecasts, and the non-availability of Crown squid quota effectively reduced the likelihood of this being achieved.

In addition, a number of other issues arose as significantly important in fisheries management as a consequence of the fundamental change to the QMS effected by the move to proportional ITQs. The principal concern relates to the Crown held quota, which the industry believes should be transferred to industry on the grounds that, as the risk of fisheries management now lies with the industry, the Crown should not be both a regulator and a potential beneficiary.

Subsequent to the above changes, a number of issues have emerged which have led to dissatisfaction on the part of industry with the administration of fisheries management in New Zealand. Although the QMS and its ITQ base is still regarded as the most sensible management regime, its administration has become a major issue, particularly the level of compensation to be delivered compared to that promised.

Estimates of likely quota reductions and resource rentals paid which have been made to arrive at likely compensation payments suggest that these will amount to no more than 37 percent of market value, amounting to a shortfall of over \$100m.

Several factors account for the diminished compensation rate:

- i) Loss of the agreed exchange of Crown owned squid quota for industry owned orange roughy quota. The Government, through Quota Appeal Authority allocations and TAC reductions, is now unable to deliver any squid quota for the exchange programme. The Act includes an agreement that the Crown offer 5 tonnes of Crown-owned squid quota for 1 tonne of orange roughy quota up to 20,000 tonnes of squid in addition to the pool of funds available for compensation. This is conservatively valued at some \$25m.
- ii) The scale of quota reductions (determined by the Government) is now much greater than anticipated at the time of the negotiations.
- iii) Resource rentals, at the time of the negotiations, were expected to generate \$125m over the transitional period. Resource rentals are now expected to amount to \$108m over the five year period, a shortfall of \$17m.
- iv) Industry have sustained greater quota reductions as a result of the Crown retaining sufficient quota to give effect to its obligations under the Maori Fisheries Act 1989.

The industry has proposed a number of solutions. Primarily it has sought an extension of the compensation period by two years. Such an extension would generate approximately \$47m in additional compensation to industry with no direct cost to Government as funding would continue to be derived from resource rentals paid over the two year period which is a further four years away. This in turn would lift the compensation payment to some 54 percent of market value. While this falls well short of the industry's expectations, it would allow additional time and funds for the industry to restructure in an orderly and non-disruptive manner. The industry has also requested that the Government dispose of its quota holdings to industry at no cost to industry.

#### Other outstanding issues

Other issues worthy of comment include restructuring, quota ownership registrations, resource rentals, exploratory fishing, quota trading and the future administration of fisheries management.

a) Restructuring

There has been substantial restructuring within the fishing industry since the introduction of the QMS, as might be expected with a quota based management system. While it is difficult to quantify the changes in terms of vessel numbers and capital investment, some data are available. For example, some 80 percent of quota has changed hands in permanent trades of quota. There has also been substantial consolidation of quota into large aggregations; the 10 major quota holders now own or control at least 80 percent of the quota.

Another issue relates to a restriction in the Fisheries Act preventing a quota holder from owning, holding or controlling more than 35% of a deepwater species of 20% by area of an inshore species. These aggregation limits are perceived by some in the industry as an impediment to further restructuring, but by others as a safeguard against too great a concentration of quota in too few hands.

There is also the question of foreign ownership of quota. At the present time, the Act precludes foreign ownership or control (beyond 24.9%) of quota. Clearly, there are arguments for and against this restriction related to restructuring, domestic industry expansion, technology transfer, and new investment.

b) Quota Ownership Registration

From the inception of the QMS, the Government declined to implement a registration system for quota ownership that guaranteed clear title to quota, primarily because of a perceived difficulty in operating a suitable system but also because it was not considered necessary to the operation of the QMS. It has emerged, however, that lenders are reluctant to advance funds against quota when a guarantee of title cannot be recorded. The lending institutions have accordingly insisted that they have security against some fixed asset rather than against the quota itself.

The industry has proposed a number of options for a quota registration system that would be incorporated into legislation and that would provide greater security to banks and other financiers relying on quota as collateral for loans. These include a stand-alone system under a Personal Property Securities arrangement, a system of registering charges over quota to identify such things as mortgages, or a registration system within the current QMS and operated by the fisheries management administering authority. Such a system would add to the data base of the QMS information on ownership, interest in, leases of and mortgages over quota.

c) Resource Rentals

This issue has caused considerable conflict between the commercial industry and Government. The dispute has centred on two things: arguments about the existence of management rent and the size of any rent and can it be measured.

The New Zealand Government maintains that significant management rents are generated by the existence and operation of the QMS and that these rents should accrue to the Government. The industry, on the other hand, is of the view that to

remove rent from the fishery will reduce future investment, inhibit innovation and technological development and leave the industry as a "controlled - profit" sector of the economy.

The industry argues that, with the move to proportional quotas and the consequential transfer of all the risk of TAC changes to the industry, all of any rent should accrue to the industry. In addition, a very strong case can be made that in New Zealand any rents that may have existed have been capitalized into the value of quota, and have in fact been captured in the transfer by sale of that quota.

d) • Exploratory Fishing

This issue has its origins in a number of legal challenges to the allocation of quota under what was previously called the "finders rights policy". Under this policy, a fisherman who discovered a stock of fish that resulted in an increase in a TAC, was entitled to up to half of the addition to that TAC. Serious conflicting claims arose in a number of cases and the policy was abandoned. The search is now on for a new system that will encourage exploration. This is not an easy proposition under a proportional TAC system where by law every quota holder in an area is entitled to share, proportionately to quota owned, in any TAC increase. A range of options are being considered, some of which would also involve legislative changes. These include collective exploration and proportionate cost sharing by quota holders with consequential proportionate allocations of any TAC increase, and the creation of exploratory future quota options which would be tendered.

e) Quota Trading

One of the fundamental bases for an ITQ system is the transferability concept. Without transferability, any scheme is largely unworkable except in the very short term and even then it has very significant drawbacks. Non-transferability prevents the efficient use of quota by restricting fisheries to existing patterns; it prevents restructuring to reduce overcapitalisation and consequently removes efficiency gains that would otherwise be made; it leads to an ageing population of fishermen because it limits the entry of new participants; it restricts the development and application of new technology.

For the first two years of the New Zealand scheme, a Quote Trading Exchange (QTE) was in operation; its intention was to facilitate the transfer of quota. However, with the concentration of significant tonnages of quota in fewer and fewer hands, it proved to be unnecessary. It was also perceived by the quota holders as revealing too much information to the Government which might use the information for judgements about appropriate levels of resource rentals. Accordingly, the QTE was abandoned and trading was left to the informal market and to a limited number of quota brokers. This appears to be working quite well although it is not easy to judge its success in strict efficiency terms.

(f) The future of fisheries management administration in New Zealand

At the present time, a great deal of conflict exists between the administration and the industry. On the one hand, both are in agreement that the QMS is the only sensible management option and that by and large it works to meet the twin objectives of conservation and sustainability, and economic efficiency. On the other hand, however, complexities have crept into the system through regulatory interference, inadequate legislation and administrative structures that have been unable to cope adequately with the operation of the system.

It must be emphasized that, when adjustments to a QMS need to be made, recognition should be given to the underlying principles on which the system is built and adjustments made within that framework. Without this, *ad hoc* interventionism is converted into legislation which in turn is designed to restrict, inhibit, prevent and regulate. It layers complications upon complexity until the system begins to falter.

This in turn then leads to the bureaucratization of the system as more and more people struggle to make inappropriate solutions work, producing increasing aggravations between the administration and users. The aim and objective is lost sight of in the bureaucratic administrative jungle. It is therefore vital that ITQ based management systems are kept simple and based securely upon underlying fundamental principles of sustainability and economic efficiency.

There is widespread agreement that changes need to be made to the administration of New Zealand fisheries management. The driving force behind the expressed desires is to minimize costs to Government of managing fisheries and the conflict and aggravation between users and Government. The Minister of Fisheries has established a Task Force to consider how all interests in fisheries management may be accommodated in one framework. The review will cover everything from the fundamentals to the fine details and will result in new fisheries legislation to replace the increasingly unworkable current Fisheries Act.

Given that the ITQ-based QMS is to remain as the central fisheries management system, the review falls into two parts. The first relates to who should manage fisheries and the second to how the legislation governing fisheries management should be revised to enable the system to operate more effectively, more efficiently and more in line with underlying principles taking into account commercial reality. It is also important that to the maximum extent possible the administration of fisheries management should be directly in the hands of the users of the resource.

No matter who manages fisheries, the functions currently undertaken will continue to be required in one form or another. These are basically policy development and refinement, operational administration, enforcement/compliance, research and information collection and analysis.

The main issue becomes one of who carries out those functions in order to ensure the users can control their own destiny.

There are common elements which can be summarized briefly as:

- i) The research function services all groups and should be able to provide this service on demand. Currently, the Government devotes some \$18 million to fisheries research and decides how it should be spent. In the future, the appropriate research priorities and funding decisions should be far more market driven. Accordingly, the research function should exist outside of the management function but be there to support it "on-demand" and at a transparent cost.
- ii) The information function is common to all user groups and will be called upon by all groups. It is another service function and should provide whatever information is needed by the user-managers, researchers or enforcement organization. The answers to the who and where questions are only important in so far as they relate to cost effectiveness and efficiency.
- iii) The enforcement/compliance function is not an integral function for user-managers. It is in fact a policing role to ensure the integrity of the system of management and the maintenance of the law. The introduction of commercial law or contract law principles will reduce some compliance costs and activities, but the need to enforce the law will still exist. It may be appropriate to see this as a law enforcement function and have it carried out as such, but with dedicated funding, by the law enforcement agency.

In brief, therefore:

- i) the fisheries management system should be administered by the users of the fisheries resource,
- ii) it should not be cluttered with the bureaucratic trappings of an administrative empire. The information and research functions can effectively be located outside the administrative framework itself and can be contracted for by a wide range of resource users for a wide range of purposes. The enforcement function should be located in a specific organization and with dedicated funding, e.g., the Police Department,
- iii) the legislation giving effect to the administration system must be carefully drafted to ensure a system that is administratively simple and above all workable,
- iv) the users of the resource, including Government on behalf of the "people", should pay for the costs of administering the system in proportion to their use of the resource. It is only reasonable to expect that if a user is managing and benefiting from a resource, that user should also make a contribution to the costs.

Finally, it must be recognized that fisheries management is not a discrete or single phase process. It is continuous and dynamic and requires evolutionary changes to make it relevant and to maintain its effectiveness.

## PROBLEMS RELATING TO COASTAL RESOURCES MANAGEMENT SYSTEMS WITH SPECIFIC REFERENCE TO THE PHILIPPINES

by

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### ABSTRACT

In many parts of Asia, freedom of entry to the fisheries has led to excessive fishing effort resulting in severely depleted resources and low incomes for the fishermen. This unfortunate situation, allied with a growing awareness of the need for environmental protection, has led to a widening recognition that more effective management systems, based on entry limitation, are now required. The paper describes, as a case study, the impact of a new fisheries sector programme to this end in Panguil Bay, the Philippines. Considerable progress has already been made in eliminating illegal fishing activities and in creating fish sanctuaries and artificial reefs. Reviewing continued problems and constraints, the author makes recommendations for further actions towards effective coastal fisheries management, in particular the award of legal authority to the local fisheries Management Council, the strengthening of the Bay's fishermen's cooperative and the extension of territorial use rights to municipal authorities. In this latter respect, the author suggests that in many parts of the region it will, because of differing traditions and social customs, not be easy to establish a "Japanese style" fishermen's cooperative system. In many cases, therefore, it may be preferable to award territorial use rights to local coastal management councils in which representatives of fishermen should be included. Attention is also drawn to the need when establishing management policies and objectives to recognize socio-economic as well as biological criteria, particularly those based upon the new concept of maximum social/income yields.

### 1. COASTAL FISHERIES RESOURCES IN SOUTHEAST ASIA

Coastal fisheries resources in many Southeast Asian countries have been depleted by overexploitation. Except in Hong Kong, Singapore and Malaysia, the population of fishing communities in the region has grown putting increased pressure on coastal resources. The subsequent competition among fishermen has led to the use of more efficient but sometimes destructive fishing gears, such as set bag net, dynamite, and a variety of poisons.

Since the establishment of the 200 mile EEZ, many countries have tried to develop their off-shore fisheries and encourage the use of trawlers and purse seiners, in the hope of

reducing pressure on coastal resources and supplying more fish to both foreign and domestic markets. Unfortunately development has not progressed rapidly enough due to lack of capital investment and sufficient resources to make a profit. Many trawlers therefore operate near neighbouring coastal waters causing problems between the countries concerned. Large commercial fishing boats also operate in coastal waters but conflict with small-scale fisheries by destroying their fishing gears.

Most countries have set up fisheries regulations to demarcate coastal fishing zones of 3-5 km, in which commercial fishery operations are prohibited, and have established fish sanctuaries to protect the juveniles of various commercial species. Governments have also implemented patrols near coastal waters to control illegal fishing. However, these measures have not been sufficient to reduce the excessive fishing effort.

The sea has been the common property of mankind since time immemorial and it is difficult to prevent newcomers from engaging in coastal fisheries. This has resulted in the tragic depletion of coastal resources, and left the majority of fishermen living at marginal income levels.

Subsistence fishermen are among the poorest of the poor in many of the region's countries, and in the Philippines, for example, this has sometimes caused political and social instability. Many regional governments have therefore encouraged coastal fishermen to change from fishing to aquaculture or other jobs on land. Malaysia, for instance, has implemented a program to reduce the number of surplus coastal fishermen by transferring them to off-shore fisheries, aquaculture and land based work.

In general, the law enforcement agencies controlling illegal fishing in coastal waters lack sufficient resources. In addition, the authorities are sometimes reluctant to enforce the law because many illegal fishermen in the area are supported by local politicians; local administrators are thus often afraid of applying the law strictly. It has therefore been very difficult to ensure compliance with legal measures for coastal resources management.

Recently increasing attention has been given to the importance of environmental conservation. This includes not only an awareness of air and water pollution, but also the loss of coastal mangrove forests and coral reefs in shallow waters due to development of shrimp farms. The destructive effects of illegal fishing are also being recognized. With this new environmental awareness, there is now a greater chance of introducing systematic coastal resources management in the region.

## **2. MAJOR ISSUES TO BE TAKEN INTO ACCOUNT IN COASTAL FISHERIES MANAGEMENT**

To achieve efficient management, limitation of entry to coastal fisheries must be considered. There are currently no governmental regulations in the region limiting entry to coastal fisheries and so anyone can fish in these areas. For example, fishermen in Thailand have to pay a fee to register their own fishing gears, but there are no limitations except on some modern gears such as trawling. Free entry has led to increased fishing effort in coastal waters resulting in severe depletion of resources and low income for the fishermen. It is therefore imperative to set up a policy for coastal fisheries management and limit entry to coastal fishing.



Governments should set up a Fisheries Management Council in each province or municipal area to regulate the following issues by law;

- (a) Limited entry to coastal fisheries.
- (b) Optimum fishing effort targets, in terms of the number of fishing gears and/or boats.
- (c) Giving the territorial use rights in fisheries to fishermen's cooperative societies and encouraging fishermen to control their own fishing gears, so sustaining their own local fishery resources.
- (d) Transfer of fishermen to other work such as mariculture and land based jobs.
- (e) Protection of environmentally valuable areas such as coral reefs and mangrove forests.

Unfortunately, the organization of the fishermen's cooperative association is weak in many Asian countries and many fishermen are not members. It would therefore be advisable to establish fisheries management councils at the local government level and include representatives of the local fishermen in the formulation and implementation of the management plan. It may take time to train them to understand and participate actively in fisheries management. However, without their active participation any management plan will be doomed to failure.

### **3. FISHERIES SECTOR PROGRAM ON COASTAL RESOURCES MANAGEMENT IN THE PHILIPPINES**

The Philippines Department of Agriculture prepared a Fisheries Sector Program on coastal resources management in 1989. Implementation began in 1990 at 12 large coastal bays selected because of their urgent reorientation needs. Funding support, a total of US\$ 155 million, was obtained from the Asian Development Bank and the Overseas Economic Cooperative Fund, Japan. The objective of the program is to eradicate all illegal fishing in coastal waters, and reduce fishing effort by transferring fishermen to other jobs in aquaculture, fish farming or local manufacturing industries when necessary. The program is called the Fisheries Sector Program and Integrated Management Plan for the Coastal Resources.

The problems and issues encountered in implementing this Program in one such bay, i.e. Panguil Bay are described below.

#### **Background**

The fishery production of Panguil Bay fell from 2,578 MT in 1985, to 662 MT in 1989. This drastic decrease was mainly attributed to illegal fishing. In addition, rich mangrove forests, which are an important nursery for juvenile fish species, had been reduced to one quarter of their former area by illegal logging and the expansion of shrimp culture, which led to conversion of large areas to ponds for shrimp farming.

At the same time the number of coastal fishermen increased by about 20% due to a lack of alternative employment opportunities on land. The subsequent competition amongst fishermen encouraged them to take up illegal fishing. Efforts to prevent this by the Bureau of Fishery and Aquatic Resources had failed repeatedly because of the lack of support from local administrative groups and congressmen.

To strengthen the enforcement of fisheries law, the Department of Agriculture requested local government to set up a Fisheries Resources Management Council to take command of the Program. Inter-agency law enforcement teams were organized by the Council to implement the Program at the municipal level, including NGOs to assist fishermen at the community level.

The major proposals of the Program are as follows:

- The establishment of a Marine Reserve Fish Sanctuary Area
- The provision of a navigation pathway in the Bay
- Establishment of artificial reef areas at suitable sites
- Demarcation of areas for mariculture, mussel culture, crab fattening, oyster culture and seaweed culture
- Provision of areas for fish coral (shallow sea set net)
- Establishment of fishing areas for : gillnet, handline, longline, drive-in-net, fish pot, cast net, multiple handline and bag net
- Establishment of Bangus/Sugupo Fry grounds
- Provision for stationary bag net and beach seine areas
- Establishment of giant clam areas
- Replantation of mangrove areas

The Bay is 116 km in length and 4-5 km wide with 76 villages on its shores housing some 7,000 fishermen.

#### Achievements of the Program

All illegal fishing gears, numbering some 1,400, have been removed by the task force or by fishermen themselves, and within two years resources have recovered substantially. Many fishermen have changed employment from fishing to seaweed culture, crab fattening, set net and gillnet fishing. Fish sanctuaries and artificial reefs have been established and are taken care of by the village fishermen with the help of NGOs at the community level.

Considerable progress has been made in strengthening law enforcement which is generally rather weak in this region. This can be attributed to the Department of Agriculture winning the cooperation of the local governor. Local politicians who had been reluctant to take any action changed their attitude because of local support for the Program.

Another success has been in the organization of an integrated council including various governmental institutions such as the Department of Agriculture, the Department of the Environment, the Department of Law and Justice, the army, local government and NGO groups. This is an important step as in many countries in the region governmental institutions are very insular and often work to protect their own interests; this can cause difficulties with collaborative projects.

#### 4. PROBLEMS AND CONSTRAINTS

In spite of the progress achieved, there are still many problems to be solved before full establishment of a viable coastal fisheries management system is possible.

##### Legal Authority

The Bay Fisheries Management Council, chaired by the Governor of Lanao del Norte, is the superior organization in the implementation of the Panguil Bay Program. However, the council has no authority based on the law. In order to control the coastal fisheries of the Bay more effectively, it should be given legal authority by the Government.

The Bay Fisheries Management Council should provide comprehensive regulations on coastal fisheries management in order to preserve resources and sustain optimum fisheries operations.

These should include:

- Control of fishing gears in the Bay.
- Protected areas for fish resources conservation including coral reefs, mangrove forests and fish sanctuaries.
- Fishing gear registration, with the Council deciding the maximum number and size allowable per gear, and net mesh size control to avoid the catching of juvenile fish.
- Division of the coastal area for stationary gears.
- Priority to fishermen who are qualified and able to operate specific fishing gears.

##### Fishermen's Cooperative Society

The cooperative association in the Bay is too weak to manage fisheries unaided and many fishermen are not yet members. It is therefore important to encourage their membership with the help of NGOs. Until the majority of fishermen are part of a cooperative society, territorial fishing rights cannot be given to the cooperative association.

Many fishermen in the Bay are requesting funds from official funding organizations such as the Land Bank, so that they can change their gears but they can only get these loans if they are part of a cooperative; thus they have to use local finance agents who charge high interest rates.

##### Territorial Use Rights

Territorial use rights are normally given to individual fishermen's cooperatives to promote effective management of coastal fisheries. In Panguil Bay, however, it might be

advisable to give the legal right to the municipal authority which is the minimum administrative unit in the Philippines covering several small fishing villages.

The municipal council should:

- (a) Plan fishing ground utilization in its territorial waters in close consultation with local fishermen.
- (b) Divide the fishing areas for each fishing gear and decide upon the maximum number of fishing gears within its territorial fishing grounds to avoid conflict among coastal fishermen. As the area available is limited, criteria should be set up for the allocation of gears.

## 5. TARGETS FOR COASTAL FISHERIES MANAGEMENT

A quantitative target for fisheries management in Panguil Bay has not yet been established. The Government has asked Mindanao State University to submit figures for an optimum size of fishing effort based on the MSY in the Bay.

The oceanographic conditions of the Bay are very complicated. The salinity of the sea water at its mouth is about 33 PPT, gradually decreasing inside the Bay to zero at its ends. There are more than 115 different species including many varieties of demersal and pelagic fish, crustaceans and molluscs. In addition to this there are many kinds of fishing gears in use, catching a large variety of fish. It may therefore be difficult to decide the MSY for each major species.

There are various options for deciding the optimum fishing effort:

- a. The amount of fishing effort necessary for fishermen to reach the break-even point.
- b. A level of fishing efforts by which the majority gets the monthly income equivalent to the marginal income level in the Philippines.
- c. A level of fishing efforts by which fishermen can achieve an income equivalent to the average income of farmers in the area.

As the fishing area of the Bay will be restricted after taking the navigational pathway into account, it will be necessary to decide the maximum allowable number of fishing gears especially for set net and mariculture, in order to avoid conflicts amongst the fishermen. Limitation of fishing gear numbers in this narrow Bay is very important when deciding the optimum fishing effort. The optimum size and number of fishing efforts cannot therefore be decided from MSY levels alone; limitation of fishing grounds and socio-economic factors around the Bay must also be taken into consideration.

Panguil Bay has special characteristics in that it is a shallow inner bay and a nursery ground for many species. It is therefore suitable for seaweed culture and fish pen culture from which fishermen can gain a higher income per unit area than from other fishing gears.

Many fishermen in the Bay wish to use smaller gillnet mesh sizes. This is very destructive to resources and its control will be of the utmost importance. The number and size of fishing gears must therefore be carefully decided.

## SUMMARY

Coastal fisheries resources are heavily depleted in the Asian region. It is therefore imperative to set up an optimum plan for coastal fisheries management in each country in order to restore these resources.

Ideally, Territorial Use Rights in coastal fisheries should be given to the respective fishermen's cooperative societies, to be controlled by the fishermen themselves with the assistance and guidance of governmental institutions, scientists and NGOs. However, it will be difficult to apply such a system, developed and refined in Japan, to the coastal fisheries management in this region. This is because coastal fishermen in tropical areas are more independent than Japanese fishermen who have been controlled since olden days by the strict rules of their village community. The majority of fishermen in this region do not belong to fishermen's cooperative societies in their countries, and it may take some time to organize such a system.

Governments should therefore take the initiative and set up coastal management councils by law in each administrative sector, such as the municipal offices in the Philippines. In the case of a large closed bay covering a coastal area of more than two provinces, for instance Panguil Bay, a coalition management council should be set up to form a common management plan based on the particular conditions of the area. Representatives of local fishermen should be included in the council to enable their active participation in the planning and implementation of the fisheries management.

With respect to the criteria used for the fisheries management target, maximum sustainable yield (MSY), the biological target of coastal resources management used to decide total allowable catch in a fishing area, will not be enough. When deciding the optimum number and size of fishing efforts, socio-economic criteria should be taken also into account. These criteria, both biological and socio-economic, need to reflect the new concept of maximum social yield; the concept is related to a certain achievable target income for fishermen under coastal fisheries management.

The level of income necessary to sustain coastal fisheries as part of national economic development may vary between areas and countries. For example, as the number of coastal fishermen has dwindled in Malaysia, it has been necessary to reduce the fishing effort in coastal waters to enable fishermen to increase their catch and achieve a higher income on a par with that of urban workers.

## **PAPUA NEW GUINEA: SEARCHING FOR AN EFFECTIVE LAGOON AND SHALLOW REEF MARINE RESOURCES MANAGEMENT SYSTEM**

by

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### **ABSTRACT**

Papua New Guinea possesses important coastal lagoon and shallow reef resources, in particular prawn, lobster, bêche-de-mer and trochus shells, which are commercially harvested for the export markets. Many of these resources are now clearly over-exploited and are in urgent need of management. By way of illustration of the overall situation, the paper examines in some detail one of these resources, the trochus shell, and in particular considers the lack of effectiveness of the few attempts already taken to manage the fishery. An especially critical problem is the inability to properly monitor and control the fisheries and to enforce the management regulations; attempts to ensure such control nationally have failed because of the great distances involved and the lack of sufficient human and financial resources. A new approach to the management of these valuable resources is now required, based upon flexible, traditional management practices embracing territorial use rights. A system involving tripartite responsibilities is proposed, including not only the national and provincial governments but also the fishing communities. The latter are believed to have a particularly important role to play, especially in ensuring compliance with the regulations without conflicting with traditions and social customs.

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<sup>1</sup>An edited and abridged version of a longer submission.

## 1. INTRODUCTION

Papua New Guinea's inshore coastal lagoon and shallow reef areas are estimated to cover 5 million hectares. Using a combined potential yield of 20 kg/ha/yr, it has been estimated that 80 000 metric tons of fish could be obtained from this area. Over the last 20 years, subsistence consumption catches accounted for 20 000 mt and 2 000 mt were taken by artisanal fisheries. Clearly, PNG shallow reef and lagoon resources are underutilized.

Some resources, such as prawn, lobster, barramundi, bêche-de-mer, trochus shell, green snail and mother of pearl (*Pinctada maxima*), are commercially harvested for the export market. Resources, such as prawns, lobster, trochus shell and sandfish, are fished at near maximum sustainable yields (MSY). In the shallow reef and lagoon areas, resources such as sandfish and trochus shell are already showing signs of localized over-harvesting, whilst goldlip (*Pinctada maxima*) have been fished out of most areas in PNG and green snails are now hard to find in many areas.

This paper examines the situation occurring in the trochus shell industry as an example of what might happen to other shallow reef and lagoon resources unless proper management regulations are introduced. Some management options that might be useful to PNG, in particular a community-based management system, are suggested.

In the long run, PNG would benefit from a management system that would combine advantages of the national and provincial management approaches (a more Western concept) with some of the more traditional management practices into a newly designed community-based management approach.

## 2. THE TROCHUS FISHERY

Trochus shell has for many years been harvested for export, mostly in the New Guinea Island areas (Fig.1). The highest production was seen after the Second World War, when demand for pearl buttons increased. As a direct result of this, PNG in 1951 exported 1 030 mt of trochus shell. More recently, exports have averaged below 400 mt per year. From 1980 to 1990, a total export value of US\$ 12 million was earned by the industry, mainly as a result of steadily rising average export prices (\$ 7 370 per ton in 1990, compared with \$ 1 000 per ton in the early 1980s).

For a Pacific island nation, resources like trochus shell provide important employment and cash earning opportunities, particularly for the rural communities on the coast and islands. Since 1987, when the world price for cash crops such as copra, cocoa and coffee started to decline, more people on the rural coastal and island areas started to participate in the harvesting of marine resources. According to the 1980 census, 14 percent of PNG's population were living in rural areas on the coast and island areas.

The average PNG beach buying price of US\$ 3.00 per kg offered to fishermen for clean trochus shell, and US\$ 5.00 per kg for good dried sandfish (bêche-de-mer), are very attractive compared to cash crop prices. Therefore, fisherfolk are attracted to move to the trochus and bêche-de-mer industry. The biggest concern for the trochus industry is that the Fisheries Act and the Continental Shelf and Natural Living Resources Act do not provide

sufficient power of control over what the fishermen can take. Whilst there are some regulations that control the taking of trochus for commercial purposes, enforcement by the national government is difficult and expensive. The major fishery areas, such as North Solomon, New Ireland Province, Milne Bay and Manus are very distant from Fishery Inspection Centres (Fig.1). Whilst the government perceives the importance of the trochus industry to the rural coastal and island communities, the current regulations are inadequate and shortages of staff and funds will continue to constrain the enforcement of any improved management plans.

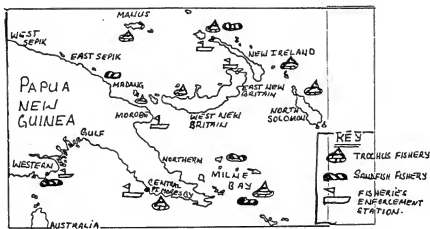


Fig. 1: Map of Papua New Guinea showing some major trochus and sandfish fisheries and the location of Fisheries Enforcement Stations

### 3. MANAGEMENT CONCERNS

Papua New Guinea has no effective management plans for commercial mollusc and holothurian. The only existing management regulations are scheduled under the PNG Continental Shelf and Natural Living Resources Act. This Act prevents foreigners (non-PNG citizens) from taking any shells (species listed under protection) for commercial purposes and lays down that shells may not be harvested with the use of breathing apparatus such as hooker and scuba. Moreover, in a country like PNG, where the major resources areas are a long way from any administrative centre, enforcement is a very difficult and expensive task.

One major management problem relates to the definition of "foreigner" under the Act. A foreigner can easily become a "national" by virtue of forming a national company in joint partnership with a resource owner registered under the National Investment Development



Agency (NIDA) Acts. In this situation, the resource owner may be led to believe that he owns the company with a 75 percent share holding and that over a five to ten year period he can own the company by buying the remaining 25 percent. The foreigner, however, may view the arrangement as a short term deal, trying to take as much as he can in a short period while the resource rent and resource abundance continue to sustain his operation. The foreigner may then leave the operation when the indicators are that the resources are declining and he might not make further marginal profits. When he leaves, the resource owner can often be left with very little or no money and in most cases resources fairly well depleted. This has commonly occurred in PNG in the sandfish fishery, causing localized over-harvesting. The NIDA Acts and the Continental Shelf and Natural Living Resources Act are administered by two different Ministries with different development policies: it therefore can be very difficult to administer any proposed management regulation on the trochus fishery and the development of the industry.

If PNG is to develop and manage its coastal inshore resources then it will first have to find a suitable way of controlling claims over traditional fishing rights. This is a very real and complex situation, embracing legal customary rights for claiming a fishing area or a right to fish with a specific fishing gear and species fishing claims. These customary claims for fishing areas may extend beyond the fringing reef to and including barrier reefs. In most cases, traditional claims also include the land above the highest water tide mark. Under the PNG National Sea's Act, rights for claiming any sea stop at the highest water tide mark. This is a Western concept and can cause serious problems; a very similar situation is found in Fiji. The PNG National Sea's Act states that all the waters and any resources in them up to the highest water tide mark belong to the State. Legally, this is logical in that the State looks after these waters and provides management control on behalf of the traditional owners against foreigners and national non-owners.

The interpretation of the National Sea's Act by the administering ministry and the Fishery Department regarding any major fisheries development proposal has often created socio-political problems. A good example is the use of royalties to compensate resource owners for tuna baitfish harvested from shallow reef and lagoon areas in New Ireland, East New Britain and Manus Province. Politically, such issues have developed in major questions of who should control and manage the waters up to and including 12 nautical miles in provinces. As a more recent development, resource owners are requesting their provincial and national governments to assist them by establishing a marine tenure system where their traditional fishing areas can be legally recognized by law, therefore necessitating amendments to the PNG National Sea's Act.

#### 4. TRADITIONAL MANAGEMENT PRACTICES

Modern fishery management models rely upon the knowledge of fishermen as to where to fish for certain fish species, the development of good fishing gears, boat and other equipment, and the development of a scientific understanding of fish and fish stocks, including exploitation and population dynamics.

Using the same information and parameters, but on a very different scale, coastal and island fishermen have learnt where to catch certain foodfish and shellfish from many years of experience. They have learnt to develop more effective ways of catching fish as their

knowledge about species and important schooling behaviour grew. They did not, however, keep written records of their catch or knowledge about fish and fish behaviour, but developed a very good memory for recording mentally these events. Through the generations, this knowledge has passed from father to son down the line. This knowledge is still available to communities and is very useful for the management of inshore coastal lagoon and shallow reef marine resources in most parts of PNG.

The Government of Papua New Guinea recognized the importance of traditional management practices and the conservation of knowledge and in 1980 organized a seminar to discuss the usefulness of contemporary management issues. Two important lessons emerged from this seminar. The first relates to problems associated with the limitations of the use of traditional management practices in modern management concepts, whilst the second suggested that traditional management practices can be a useful tool if modified or integrated with present management concepts. It was also stressed that the importance of resources management should be built up in the country's policies for natural resources use and that fisheries development projects in PNG should be designed to be compatible with useful traditions and customs, or with some mutually agreed modifications of them.

Ten years later, efforts are still required in PNG to introduce better management of trochus shell and bêche-de-mer resources and the management of the inshore coastal lagoon and shallow reef resources. In this respect, the application of community-based management systems, if designed to suit a country or even a small community, can be very useful. For example, elsewhere in the Pacific, the Cook Islands, using the services of the Islands' council chiefs, have been successfully managing their trochus shell fishery in this way. Projects like this, and the Marovo Lagoon in the Solomon Islands, are heading in the right direction. Local organizations embracing resource owners and community administrators might be more useful than centralized bodies to implement fisheries regulations relating to coastal inshore lagoon and shallow reef resources, and would certainly save funds and staffing for PNG and most of the Pacific Island States.

Resources surveys conducted in Manus, New Ireland and West New Britain found that fishermen are more concerned about the future of their trochus shells and bêche-de-mer resources now that catch rates and average sizes caught are declining. Many resource owners are prepared to accept any changes that would improve the management of their trochus resources, provided that these do not impose strong changes that would alter their traditional and social life style. It is a good sign that resource owners would be willing to undertake good management regulation changes that would benefit the community on the whole rather than some group of fishermen. When people become aware that resources can be over-harvested they are more ready and eager to accept new ideas, provided that such changes do not disrupt social and traditional patterns. With any new government intervention regarding the improvement of inshore coastal lagoon and shallow reef resources management, the resource owners must first be willing to accept changes provided that they are for the benefit of the community.

Papua New Guinea has not yet introduced management schemes for the exploitation of coastal inshore lagoon and shallow reef resources. Even if good policy bases were established, the national government alone, or even the provincial government, cannot enforce any management regulations effectively. The government should cautiously

decentralize some of its powers to provinces and the communities so that regulations can be effectively implemented and enforced. It would certainly save government time and money. Presently, all the powers of resources management are with the national government and this has led to a number of maritime provinces experiencing localized over-harvesting of trochus and bêche-de-mer resources. Whilst this does not affect the country as a whole, the impact is more pronounced at the provincial and community level. As part of this concern, a number of maritime provincial governments have developed Marine Resources Protection Acts and hopefully these legal instruments should assist in the management of the coastal inshore lagoon and shallow reef resources and act as a start for the development of community-based management systems.

## 5. THE TROCHUS FISHERY IN NEW GUINEA ISLANDS

From 1980 to 1990, the main trochus shell producing areas in the New Guinea Islands were North Solomon Province, New Ireland Province and Manus Province. These provinces accounted for 41 percent of total PNG production. However, production figures available are believed to be much lower than what has actually been exported. Good data collection is a big problem.

Since 1989, the government has begun to develop a collection system for catch and effort data, location of catch, annual provincial production for various major groups of marine resources and other important economic and biological data. The data collection will be kept simple so that, hopefully, fishermen will be able to collect catch data. Because of lack of reliable data, very little can be done to assess the trochus resources in the New Guinea Island region. Some information is available from purchase receipts kept by shell buying agents. This kind of information has its limitations, but can be very useful in the absence of other data. One such set of data for Manus Province has been kept by Ron Knight Pty. Ltd. This data is used to demonstrate how present government management regulation enforcement could affect the trochus industry at community level and suggests how this might be improved.

According to Ron Knight, in 1989 and 1990 his landings accounted for about 70 to 80 percent of the total landings for Manus. Prices for clean, dried trochus shells landed in Lorengau (urban centre) rose from an average of US\$ 2.00 per kg in 1987 to US\$ 5.65 in 1990. The impact this had on the Manus trochus industry was very striking. The number of fishermen involved in the industry increased from 1 500 in 1987 to 11 750 in 1990. The resources were exposed to very increased fishing pressure over this four year period. Catch rates fell, although production remained at 67 mt for two years.

## 6. MANUS MARINE RESOURCES PROTECTION ACT

In 1988, fishermen on the south coast of Manus were already expressing concern about their trochus resources. Similarly, when the price for trochus increased, fishermen from the east coast began poaching for trochus on unfished reefs on the west coast and even as far east as Mussau and Emirau Island in New Ireland. Relatives on other islands extended their family rights to fish in productive reef areas of their clanship, for which they no longer had the rights. This is an accepted custom provided permission is sought first.

The Provincial Government of Manus, realizing that the national government was not able to solve their problems, drafted a Marine Resources Protection Act. The Manus Provincial Government requested the National Fisheries Council to assist them by recommending to the national government that Manus be allowed to go ahead and pass the Act. By 1990, the Manus Provincial Government could not wait any longer and, because of pressure from the fishermen, saw their Provincial Assembly pass the Marine Resources Protection Act in mid-1990. New Ireland and West New Britain Provinces followed soon after (1991).

Part of the Manus Marine Resources Protection Act regarding trochus shell resources regulates that:

1. All fishermen (family) should be licensed to fish for trochus in their own traditional reef areas.
2. The minimum and maximum size limit for trochus shell caught should be 8 cm to 12 cm respectively.
3. No fisherman is allowed to take any trochus shell with the assistance of such breathing apparatus as hooker and scuba gears.
4. No fisherman is allowed to use any form of lights to assist him in collecting (catching) trochus shell at night and all night fishing is prohibited.

The Manus Provincial Government attempted to register all owners of known traditional fishing areas as a step towards development of a marine tenure system. The attempt encountered problems in 1991 and the project was shelved. From this work, management areas would have been established. It was also planned that the communities, under the leadership of their community leader and the chief clan head, would control the enforcement of the management regulations in their own fishing areas.

The Manus Marine Resources Protection Act could not be properly implemented because of funding and staffing problems. Similar kinds of problems are being faced by the national Acts dealing with the management of trochus resources throughout the country. The main advantage of having specific provincial marine resource management regulations is that the emphasis of management on various important marine resources would certainly differ from province to province.

#### 7. MANUS TROCHUS FISHERY 1987-1990

The Manus provincial boundary includes the Western Islands and more recently Wuvulu Island. Traditionally, the people of Manus are divided into three main ethnic groups. The "Wiusia" are inland people who fear the sea and have very little to do with fishing. The second group, the "Matanghol", live on the west coast of Manus, Low Island, Baluan and Rabutocho Island on the south coast and all along the north and east coasts. This group of people make use of the land for gardening and the sea for fishing. The Matanghols only fish on the fringing reefs or reefs and shallow lagoons next to the village, as they fear the open sea. A few of the Matanghol fishermen possess sufficient sailing skills to move

from one island to the next; this group is known as the "Mwanus". They are ocean-going people and possess large outrigger canoes; they sail from island to island or to the coastal areas to trade their seafood in exchange for garden food.

When it comes to fishing for trochus shells or managing the fishery, the Matanghols and the Mwanusians will probably play a major leading role in the industry. In Manus it is mostly the Mwanusians and the Matanghols who make up the majority of fishermen.

In 1987, an estimated 1 500 people fished for trochus. However, in 1990, 11 750 were recorded (source: Ron Knight Pty Ltd. purchase dockets). Within four years, fishermen fishing for trochus had increased almost eightfold and, similarly, production increased from 25 mt to 67 mt for the same period. Ron Knight Pty Ltd., one of the three remaining shell buying companies, showed for the same production (25 mt and 67 mt) a total shell value of US\$ 52 000 paid to the fishermen. In 1990, the same company paid US\$ 383 110 to 11 750 fishermen. From these values, it is obvious why the Manus Provincial Government and marine resource owners are making serious attempts to manage these resources.

## 8. CURRENT STATUS OF THE TROCHUS RESOURCES

The trochus resources in Manus Province are certainly being fished at near maximum sustainable yield. If all production was declared, total annual production for the last three to four years would certainly be around 100 mt to 120 mt. During the period 1987 to 1990, the south coast trochus resources have suffered a much greater fishing pressure compared to the north coast fishery. The western trochus resources being a relatively new fishery, catches continue to increase; on the other hand, the eastern coast fishery may be experiencing localized over-harvesting.

Using sales records as surrogates for more scientific data, a number of indicators can be identified regarding catch rates and shell sizes. If it is assumed that there has not been a serious recruitment failure in the last five years or so, then certainly trochus resources are declining on the south coast and there is a possibility that the eastern coast fishery might follow in the next two years if no management measures are taken now by the communities themselves. The west coast is the only region where catch rates are still increasing; however, most of the barrier reefs are a long way from village sites and poaching is a serious problem. Poaching is now a common activity in Manus, but the national regulations cannot assist in this regard. This is where a community enforcement approach is much more pertinent to such a situation.

On the north coast, some village communities were exercising management control and, in particular, the Pytilu community were using total allowable catch (TAC); in 1989 and 1990 fishermen were allowed to fish 5 mt. Andra, Ahus and Hawaii use closed fishing seasons. Hawaii traditionally has two fishing seasons per year and each season lasts for two weeks. Andra and Ahus closed off their fishery every two years. These two communities were supposed to have closed seasons in 1989 and 1990. However, this was the period when trochus prices were the highest and the fishermen from Andra and Ahus, with the permission of the chief, continued to fish. On the south and east coasts, no traditional fishery management practices exist; these areas were viewed as an open fishery and relatives from

other areas were allowed to fish in the productive areas on the south coast. The status of trochus resources on the north and south coasts is a good indication of what may be happening to the rest of PNG trochus resources. The south coast situation shows that, in the absence of management control, resources become depleted and communities lose employment and income. The north coast situation indicates that useful traditional control and management practices, if legally enforced, can save the government money and time and that the resources will continue to be harvested at a maximum sustainable level.

## 9. CONCLUSION

Little has been done to manage the inshore coastal lagoon and shallow reefs resources in PNG. Even where some attempts have been made, the enforcement of the regulations is often expensive, ineffective and often does not suit the rural communities in which the resources are available. The Government of Papua New Guinea has placed more emphasis on the management of commercial offshore resources, such as prawns, lobster and tuna. These resources earned more than US\$ 20 million for the country in 1991. The government therefore directed enforcement efforts towards monitoring the offshore commercial resources. However, these efforts remain handicapped by insufficient funding, staffing and suitable boats to provide adequate surveillance.

In the long run, the government will have to pay attention to the management of the inshore coastal resources to provide employment and equal distribution of income to the rural sectors. Employment and income opportunities derived from the harvest of high-valued coastal species may encourage young unemployed people in the major urban centres to move slowly back to their rural villages.

The trochus, green snail, goldlip, blacklip and bêche-de-mer resources will continue to represent a major industry needing effective management. Whilst management regulations for these resources have been proposed to the national government in 1989 and 1990, nothing has been done so far. Maritime provinces such as Manus, New Ireland and West New Britain are already attempting to pass management regulations in their Provincial Assemblies. However, they are constrained by manpower and funding factors.

The north coast trochus fishery in the Manus Province has, over the last four years, used traditional management practices with some success. Community-based management systems for marine resources is a relatively new concept in the Pacific. Papua New Guinea realizes that there are advantages in such systems. Attempts to enforce trochus resource management regulations have been expensive and ineffective at the national government and even provincial levels. In the light of these constraints, consideration should be given to decentralizing powers for managing some of the inshore coastal resources to the provincial and community levels.

The situation in the Manus trochus fishery illustrates what is happening to the trochus resources in PNG. The north coast resources represent a situation where resources are currently being fished at or near maximum sustainable yield. The west coast is a relatively new fishery and production is still increasing. The east coast resources may have reached MSY and show signs of declining. The south coast resources are certainly under great fishing pressure and are declining. Mean shell sizes are believed to be decreasing.

The provincial estimated harvests for 1988 to 1990 were believed to be between 100 and 120 mt. This shows that *Manus trochus* resources are now being harvested at maximum sustainable yields; according to the provincial management approach, this is good management. For the south coast fishing communities this is not the case with their resources, and stronger management control is required. Similarly, the east coast fishermen, given another two years of fishing at present levels, could be in the same position as the fishermen on the south coast.

In the trochus industry, the best approach should rely upon three levels of management (national, provincial and the community). First, the national government should legislate broader management regulations applicable to the nation. These should include:

1. Minimum and maximum size of 8 cm and 12 cm respectively for trochus shell.
2. Total allowable catch for each province to be set at MSY.
3. Restrict the use of any breathing apparatus such as hooker and scuba.
4. All fisheries should designate specific productive areas as sanctuaries or reserves.
5. All fishermen, shell buyers and shell exporters should be regulated by licensing.

The national government, under the Fisheries Act, should recognize the various provincial marine resources protection acts and use them to enforce these regulations through their respective provinces. The provincial management regulations should be flexible enough to encourage communities and fishermen to make management rules that can be enforced effectively at the community level without disturbing social and traditional activities.

## THE STATE AND PROSPECTS OF STOCK ENHANCEMENT ("SAIBAI GYOGYO") PROJECTS IN JAPAN

by

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### ABSTRACT

In the early 1960s, faced by declining resources as a result of overfishing and environmental changes, Japan created a stock enhancement ("Saibai Gyogyo") programme based upon fingerling production and restocking operations. These projects aim at the enhancement of the coastal stocks of marine organisms such as red sea bream, flounder, abalone, sea urchins, Kuruma prawns, crabs, etc., by sustaining a high survival rate of cultured fingerlings, rearing them to the appropriate size and then releasing them in coastal waters suitable for their further growth. The paper describes the current state of technological developments in fingerling production and restocking, notably with red sea bream and gives examples of successful enhancement projects in the Kanagawa Prefecture which embraces Tokyo Bay and Sagami Bay. In general, the prospects for the further expansion of "Saibai Gyogyo" projects are good. The main issues still to be resolved relate primarily to ensuring that restocking costs do not exceed the value of the increased catches obtained through enhancement programmes; these problems must rely mainly upon further funding and technological advances supported by national and prefectural governments. It is also of critical importance that the fishermen themselves and their cooperative associations should be more involved in and actively committed to the further development of stock enhancement techniques and projects.

### INTRODUCTION

"Saibai Gyogyo" projects can be defined as stock enhancement programmes for producing fingerlings of marine resources effectively under human management, sustaining high survival rates and, after rearing them to the appropriate size, releasing them into suitable natural waters and then managing the fishing grounds and fisheries properly before catching them. Traditionally, such projects are also referred to as "sea farming", "marine ranching" or "sea ranching". However, "sea farming" might be confused with marine aquaculture in which fish are taken care of until they reach a size suitable for marketing, while "marine ranching" and "sea ranching" are used in a broader sense which includes the construction of artificial fishing reefs, etc. Therefore, the term "saibai gyogyo" projects is used in this paper.



### Aims and history of "saibai gyogyo" projects

In the early 1960s, when Japan was moving into a period of high economic growth, the marine resources of the coastal fisheries were tending to decrease. Tidal areas and seaweed beds, the spawning and nursery habitats of fish and shellfish, had been rapidly lost due to pollution, reclamation works and many various coastal land developments, as well as increased fishing effort.

In view of this, a stock enhancement programme of marine organisms was planned and the concept of fingerling production and restocking operation was introduced. Through this concept, fish is reared during the larval stage, when most of them would perish in a natural sea environment, and then the natural waters are restocked with the fingerlings, thereby sustaining a high survival rate.

The aims of "saibai gyogyo" projects are to enhance the stock of the marine organisms which have diminished in the coastal areas (e.g., red sea bream, Japanese flounder, abalone, sea urchins, Kuruma prawns, swimming crabs, etc.) by sustaining a high survival rate (fingerling production); to rear them to the appropriate size for restocking (short-time culture to accommodate them to wild conditions) and then to release to natural waters suitable for growing; to manage fishing efforts in order to restore the level of living stock; and, consequently, to obtain a sustainable yield without deleterious effects on the ecosystem.

In 1963, National Sea-Farming Centers, constructed by the national government, were opened on the coast of the Inland Sea. After 1973, as the concept of "saibai gyogyo" projects became more widely known, programmes were introduced for the establishment of Prefectural Sea-Farming Centers.

The National Sea-Farming Centers have been operated by the Japan Sea-Farming Association (JASFA), which is established as a public-service corporation. These Centers now function as a technological development center to promote "saibai gyogyo" projects, taking full advantage of fisheries characteristics of the various fishing districts of Japan.

There are now 14 National Sea-Farming Centers and 45 Prefectural sea-farming centers. Furthermore, many cities, towns, villages, fishery cooperatives and other fisheries related organizations have their own sea-farming centers (Fig. 1).

### Current state of technological development in fingerling production and restocking

Red sea bream can be noted as the advanced case of "saibai gyogyo" projects. The development of fingerling producing technology for red sea bream first began in 1965. At first, hormone injections were used on wild parents for the purpose of egg extraction. However, in 1968, after the observance of natural spawning in water tanks, a new method of egg extraction has been established: eggs spawned by parents reared on nutrient enriched food were taken from the pond. This method enables a higher quality of egg to be obtained due to the high fertilization and hatching rate. Early spawning of eggs in heated circulation tanks is now being practised and a rearing technology for parents has now been established.

With regard to live food, technologies for mass culture of rotifer (*Brachionus plicatilis*) and early food for larvae have been under development since 1965, as well as culture technologies for food nannochloropsis (plant plankton). Formulated food for fingerlings has also been developed and the outcome of these new technologies is the mass production of fingerlings.

In the area of technologies for mass production of fingerlings, mechanization and the reduction of labour have resulted in sea-farming centers incorporating automatic feeding machines and tank bottom cleaning machines, etc.,

The release of marked fingerlings was introduced in the late 1970s. Research has been carried out on the growth process of fingerlings, their survival rate in the natural waters, and how many are recaptured as fisheries resources, in order to evaluate the effectiveness from a technical and economical point of view.

#### Examples of "saibai gyogyo" projects in Kanagawa Prefecture

##### (1) Establishment of organizations to promote "saibai gyogyo" projects and their roles

In 1985, the Kanagawa Prefecture "saibai gyogyo" projects Association was established through contributions by 15 coastal cities and towns and 56 organizations involved with fisheries.

The Kanagawa Sea-Farming Association, as a private organization, has taken over the fingerling production and restocking projects (of red sea bream, black sea bream, abalone) which were previously in the hands of the Prefectural Sea-Farming Center. It also has other roles such as to create stocks of various fingerlings from both inside and outside the prefecture, to assist other cooperative organizations in the acquisition and distribution of fingerlings for stocking or cultivation, and to organize promotional activities for the projects.

The Prefectural Sea-Farming Center concentrates upon making technical developments in the realm of fingerling production for new species (e.g. Japanese flounder, top shell, Japanese abalone).

##### (2) Main projects: Red Sea Bream Stock Enhancement

Catches of red sea bream in Kanagawa dropped to 40 tons p.a. in the 1970s, compared with 100 tons in the 1950s. Consequently, stock enhancement programmes have been carried out since 1978 to restore the diminished stock.

###### a. Fingerling Production

Red sea bream parents are reared in a large seawater pond at the prefectural fisheries experimental station in Jogashima. From around April to June, the best fertilized eggs spawned there by parents are placed in a rearing tank and then fed on rotifer, brine shrimp and formulated food for about 40 days in accordance with their stage, until they reach a size of around 2 cm.

They are then moved into a net pen floating in the calm bay and fed on formulated food, fish meat mince, etc. in order to get them accustomed to the wild.

b. Restocking Programme

Tokyo Bay and Sagami Bay are restocked with about 800,000 red sea bream fingerlings which will have reached about 5 cm in total length within 70 days after hatching. They are released in places where they can grow to a commercial size without uneconomical catches, particularly in nursery habitats which have artificial fishing reefs.

c. Movement of restocked fish

Most of the restocked fish remain around the release site where they have been restocked until they reach about three years of age. The adult fish, older than three years, are mostly captured in the spawning grounds in various parts of the prefecture (Fig. 2).

d. Restocking effectiveness

Restocked fish reach about 17 cm in length and 120g in weight within one year, 30 cm and 650g after three years and 44 cm and 1.9kg in six years.

A total of 1,300,000 fish have been added to the resources of red sea bream as a result of fingerling restocking since 1978 and catches have grown to a level of 50 tons. The resources of red sea bream has been recovering steadily (Fig. 3).

Recovery rates of marked fish over the 12 years from 1979 are 42% for set nets, 26% for gill nets and 19% for sport fishing. The rate for sport fishing has recently increased.

(3) Prospects for the future

The red sea bream stock enhancement programme is still under way in Kanagawa Prefecture and 800,000 fish of 7-10 cm in total length are restocked every year. The aggregate catch of fishermen and sport fishermen in Kanagawa amounts to more than 100 tons, which is a return to the catch level of the 1950s.

Of these catches, sports fishing accounts for about 70 tons. The project is not only beneficial to the fisheries, but also to the general public in terms of sport fishing. The sport fishing industry, enjoying the benefits of the project, provides funds and actively participates in the project. Sport fishermen and those who love the sea also make private monetary contributions to the project.

The red sea bream stock enhancement programme in Kanagawa Prefecture will continue developing, involving sport fishermen and the public, with the Kanagawa Sea-Farming Association playing the leading role.

### Outlook for the popularization of "saibai gyogyo" projects including fund-raising aspects

It is now possible for the fingerlings of 80 kinds of fish and shellfish to be reared and restocked. Red sea bream, Japanese flounder, various species of abalone and sea urchin and swimming crab are restocked in millions, Kuruma prawn in hundreds of millions, and scallop in billions.

Although the project has achieved mass production of fingerlings of fish and shellfish, the output is not always stable and many technical problems remain unsolved, and the economic effects can be seen only in some types of fish or in certain areas. Many of the organizations which are mainly managed by fisheries associations, need to reinforce the departments in charge of business income and shared funds.

Given success in tackling the following problems, future prospects for the popularization of "saibai gyogyo" projects, including fund raising aspects, will be good:

#### (1) Problems for the national and prefectural governments

Regardless of how much restocking is carried out, if the expenses involved in the restocking process exceed the catch value of the restocked fish, the project would not be profitable and the popularization of "saibai gyogyo" projects would be difficult to achieve. To reinforce the economic effects, the national and prefectural governments should contribute to the technological developments promoting the stable mass production of fingerlings and a reduction in the fingerling production cost. If a technique could be developed which would ensure high quality fingerlings in large quantities at a steady rate every year, fingerling production by fishermen themselves would get along well.

Another problem is the development of effective technologies for restocking fingerlings to natural waters suitable for growing. It is necessary to study when, where and what size of fingerlings to stock in order to sustain a high survival rate and to enable fishermen to catch proper-sized fish. In this process, the technologies of accommodation to the wild condition need to be improved to reinforce the constitution of the fingerling produced at the sea-farming centers. The scientific evaluation of restocking effectiveness also needs to be improved to reinforce the fingerling restocking projects.

#### (2) Problems for the fishermen

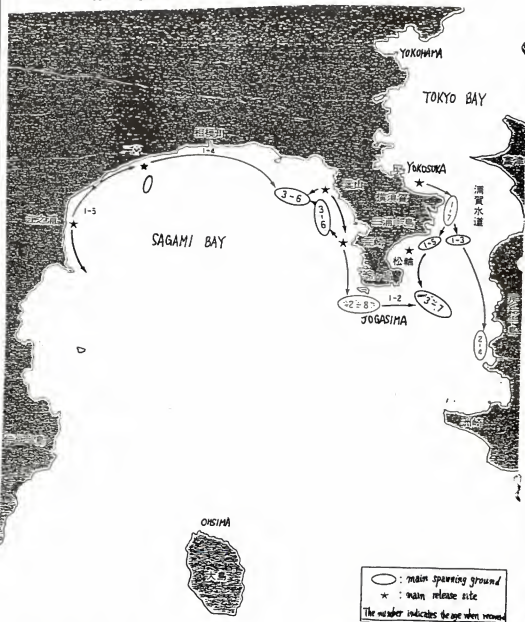
The active commitment of fishermen is essential for the development of "saibai gyogyo" projects as a stock enhancement programme. In order to carry out the project in a way that is beneficial to themselves, fishermen need to have a much greater knowledge of "saibai gyogyo" projects and to find a way to make them profitable. In order to increase the value of their catch through the project and to make a stable income, they will need to study seriously how to rear fingerlings from sea-farming centers to a size appropriate for restocking, and how to manage them until they reach the proper size for catching. The coastal fisheries in Japan will have a bright future if the fishermen themselves would lead "saibai gyogyo" projects.

Fig.1: Locations of National and Prefectural Sea-Farming Centers  
(including those currently under planning or construction)

- National Sea-Farming Centers
- Metropolitan and Prefectural Sea-Farming Centers

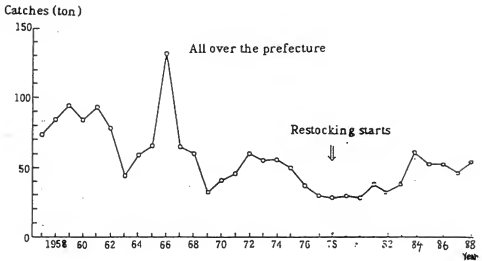


Fig 2 - Typical Migration of Stocked Fish



Most of the stocked fish remain around release site areas until they are 3 years of age. Adult fish over 3 years of age are mostly recaptured around the spawning grounds in various parts of the prefecture.

Fig 3 - Yearly Change in Catches of Red Sea Bream in Managawa Prefecture



## CASE STUDIES OF COMMUNITY-BASED APPROACHES TO RESOURCE MANAGEMENT IN SRI LANKA

by

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### ABSTRACT

Attempts in Sri Lanka to manage the fisheries by entry limitation and other centrally imposed regulations have not yet been very satisfactory. The government is therefore now encouraging the establishment of fishermen's cooperatives at the village level in order to promote a self regulatory approach to management and conservation. The paper describes two case studies exemplifying this new policy. The first relates to the development in North West Sri Lanka of a fishery for shrimps using 3.5 t motorised vessels. Realising that conflicts with the traditional beach seine fishery for shrimp might lead to a ban on trawling, the trawler fishermen established an Association to control the orderly operation of trawl fishing. The Association laid down rules governing the timing, frequency and areas for trawl operations. The second example concerns the self-regulation by the community of a traditional beach seine fishery on the South West coast of Sri Lanka. Partly because of social traditions regarding the transfer of ownership of fishing equipment, there had been a considerable growth in the number of seine nets and net setting craft owned in a community exploiting privileged rights to a foreshore area of less than 800 m. The community itself therefore introduced and administered a fishing system based upon the equitable rotation of the seines and craft. Although government policy remains one of promoting community-based approaches to self regulatory management, a number of important issues are unresolved, e.g., whether to retain the privileges accorded to traditional beach seine operations or to encourage more efficient types of fishing methods which could make a more substantial contribution to the overall objective of increasing fish production.

### INTRODUCTION

With the declaration of the Exclusive Economic Zone (EEZ) of Sri Lanka in 1977, about 256 400 km<sup>2</sup> of sea came under the national jurisdiction; the width of the continental shelf rarely extends beyond 40 km and the average is about 25 km. There are, in addition, inland freshwater reservoirs amounting to about 160,000 ha. and brackish water lagoons, estuaries and mangrove swamps of about 120,000 ha. Figure 1 shows the EEZ, Indo-Sri Lanka Maritime Boundary and the Historic Waters.



The present population of Sri Lanka, is about 16 million. The population is predominantly rural (about 78% rural and 22% urban).

Due to the religious and cultural background, the majority of Sri Lankans prefer fish to meat. It provides essential animal proteins for the population. In fact, 60% of the total animal protein requirements are supplied by fish, which is and important consideration for the development of fisheries.

The level of production is in the region of 200 000 t p.a. of which about 80% is from marine fisheries, the balance being from inland fisheries. The fisheries are predominantly small-scale and rural-based. Out of the total marine fish production, over 96% comes from the small-scale coastal fisheries. The per capita fish availability was some 15.4 kg p.a.. About 98 500 persons are engaged in the primary production sector and about 28 000 in marketing, production of fishing gear and ice, boat manufacture, repair of boats, engines etc. Families and dependants constitute about 500 000. There are approximately 950 fishing villages scattered round the island. In accordance with Government policy about 75 000 (60 000 male, 15 000 female) members have been organized in 750 fisheries cooperative societies (FCSs) at village level.

The annual sustainable yield in the coastal waters of Sri Lanka has been estimated at about 250 000 t a variety of fishing craft, both traditional and motorize, as well as other tapes of traditional fishing gear, exploit these resources. At present, there are about 28 000 fishing craft in operation out of which nearly a half are mechanized.

Sri Lanka mainly exports crustaceans, such as shrimps and lobsters, beche-de-mer, shark fins etc. to Japan, the USA, Hong Kong and Singapore. Shrimps fetch very high prices in local and international markets and therefore, shrimp fishing effort has increased over the years in both traditional and mechanized fisheries. In 1990, exports amounted to valued at Rs. 683 million; 37 627 t of fish products were imported, principally canned and dried fish, at a cost of Rs. 950 million.

Up to 1983, there was a steady increase in fish production in Sri Lanka, reflecting to a programme of motorization of fishing craft commencing from 1950s. and introduction of synthetic nets in early 1960s. Since 1983 production has decreased due to ethnic disturbances in important fish producing areas in the North and East.

In early 1980s, with the annual fish production reaching maximum sustainable levels, the need for management and conservation of coastal fishery resources was felt. During this period active fishing gear types like purse-seining, surrounding nets, etc. were introduced in substantial numbers making proper management of resources essential. Legislation was introduced in 1975 to manage spiny lobsters which were depleted due to heavy exploitation based on high economic value.

In 1986, Purse-seine Regulations were introduced restricting the number of units to be operated in specified areas based on scientific studies. A high resource fee was introduced with a view to managing the fishery by limiting the number of entrants to the fishery. Beach-seine fishing regulations were introduced in 1985. In addition to these national level management measures, others were introduced at local levels, mainly in response to conflicts among resource users.

Although these management measures were imposed from above, it is recognized that the best methods of management and conservation of coastal fishery resources and environmental protection are those based on community-based self-regulatory approaches. Such approaches in Sri Lanka can be found in bottom trawling using 3.5 t motorized boats in Chilaw and beach-seine fishing in Wathuregama. Figure 2 shows the areas selected for the case studies.

# **1. CASE STUDY 1. TRAWL FISHERY USING 3.5 T MOTORIZED BOATS IN CHILAW**

## **1.1 General Description of Fisheries in Chilaw**

Chilaw, situated in the Northwestern part of the island, is an important town in the Puttalam District with a population of about 610 500 (1989). Fishing industry an important economic activity. In 1989, the total number of active fishermen was 7 175. For 6500 of these, fishing was the sole source of income, while for another 468, it is the main source of income. Total fish production i about 15 300 t. In recognition of the local economic importance of the fishing industry by a District Fisheries Extension Officer (DFEO), the representative of the Department of Fisheries and Aquatic Resources, has been posted, in Mahawewa, about 16 km south of Chilaw. Fisheries Inspectors work with the DFEO to undertake fisheries development, extension, enforcement of regulations etc. In keeping with the Government fisheries cooperative societies (FCSs), 10,312 members have been formed into 54 FCSs in the Chilaw DFEO's Division. This policy was formulated in 1989 with the view of managing fisheries more effectively at local level and is based on community-based management and conservation of coastal fishery resources. The Government has provided infrastructure such as ice plants, boat building yard, fish processing and freezing facilities. But facilities for anchoring boats are limited and a fully equipped harbour is proposed for Chilaw. The village level FCSs are integrated vertically to a Secondary Fisheries Cooperative Union through which they are in turn integrated to a National Fisheries Cooperative Federation.

There are 3735 fishing boats in Chilaw DFEO Division (See table 1). Out of these, there are 246, 3 .5 t (8.5 m) boats. The 150 boats engaged in shrimp trawling in this category have old engines which are not suitable for deep sea fisheries. Many traditional craft are engaged in fishing in this area with trammel net. Both motorized and artisanal fishing craft operate from October to April.

A feature of the fishing industry in Chilaw is th : trawling by 3.5 t motorized boats. Although this category of boats is meant for fishing in waters away from the inshore areas, these undertake trawling in rich shrimp grounds close to the shore as the boats are old. This case study illustrates how a community-based approach to the management and conservation of coastal marine resources and environmental protection is possible with participation at grassroots levels.

Table 1

Number of Fishing Craft in the Chilaw DFE0 Division, 1991

Non-Motorized Craft			Motorized Craft					Total
"Orus" "Theppams" Beach (canoes) (log seine rafts) craft			Motorized (m)	5-7 (m)	8.5 (m)	10-10 (m)	over 10 (over 6 t)	
228	1 573	27	45	1 578	246	15	24	3 736

Source: Department of Fisheries and Aquatic Resources

## 1.2 Legal Institutional Framework

Legislation pertaining to fisheries in Sri Lanka is incorporated in the Fisheries Ordinance under which regulations are frame to manage fisheries. There are no regulations at present to manage the fisheries covered by this case study but with increasing incidence of conflicts among resource users, regulations are to be framed.

Chilaw is situated in the Administrative District of Puttalam and the DFE0, with his staff of Fisheries Inspectors, is responsible for the enforcement of regulations as well as to settle any conflicts.

## 1.3 Trawling in Chilaw Using 3.5 t Motorized Boats

Due to discharges of nutrient rich water from the Chilaw lagoon and Deduru rivulet, the Chilaw waters are rich in shrimp and fish resources. The Chilaw lagoon is a nursery ground for shrimp. Because of the high economic values of shrimp, there have been conflicts among the resource users. In these rich shrimp ground in the inshore wats, exploitation is undertaken both by fishermen using traditional fishing craft (a type of log raft called "theppam") with trammel nets and by 3.5 t motorized boats with bottom trawl nets.

The traditional log rafts operate between 4.00 to 7.00 hrs. in depths of 5.5 - 6 fathoms. The catch is mainly *Penaeus indicus* and *P. merguensis* together with some fin fish species and crabs. Motorized boats operate between 5.00 to 12.00 hrs. at 5 - 5.5 fathoms catching mainly large varieties of shrimp such as *P. indicus* *P. merguensis* *P. semisulcatus* as well as small varieties as *Metapenaeus dobsoni*, *Parapenaeopsis stylifera*, *P. cornuta* etc. with many fin fish species as a by-catch.

Beach-seines are also operated in the area. Up to 1962, only beach-seines and traditional craft were operated in the area but subsequently, with motorization of fishing craft, the 3.5 t boasts were introduced. With the increase in the value of shrimps, fishing effort grew. Many fishermen operating traditional craft had conflicts with fishermen using motorized boats and argued that the 3.5 t mechanized boats, which need a comparatively higher investment, should not be operated in inshore waters which should be reserved for

fishermen operating traditional craft. On the other hand, fishermen using bottom trawls with motorized boats maintain that fishermen using traditional craft do not take sufficient quantities of shrimp thereby "losing" the resource. Shrimps have a short life span and if not exploit, the resource is subject to predators and natural mortality.

About 130 3.5 t boats and 160 theppams are engaged in exploitation of shrimp resources. In addition, some 225 theppams exploit other fishery resources. Many beach-seine nets operated in the coastal areas adjoining these marine areas. The fishing season is from October to May but on calm days during monsoons these craft are operated. The production per day from a theppam is 2 - 10 kg and from a 3.5 t boat is 20 - 50 kg. Income varies from Rs 200-600 (US\$, 5-14) for theppams and Rs. 400- 1200 (US\$ 10-29) for 3.5 t boats. The total investment for a fishing unit with theppam is about Rs. 8 000 (US\$ 190) while that for a 3.5 boat is over Rs. 150 000 (US\$ 3 571) as old boats are employed. Operational costs is amount to Rs. 200-300 (US\$ 5-7) for fuel for 3.5 t motorized trawling and Rs. 320 for theppam fishing.

The 3.5 t boats use 1.3 cm nets at the cod end and 1.0 cm at the wings. The by-catch consists of several species of fish which are not utilized for human consumption. The trammel nets used in theppams have mesh sizes of 2.5 -5 cm.

From the early 1980s onwards, conflicts among resource users increased. The fishermen tried unsuccessfully to solve the conflicts and the authorities have been found it difficult to bring about any amicable settlements.

#### 1.4 Involvement of Resource Users in Management

During this period that fishermen using bottom trawls with 3.5 t mechanized boats, who get a comparatively better catch, realized that management measures were necessary for the sustainable exploitation of shrimp and fish resources. With the number of conflicts increasing and fearing that these might lead to eventual banning of shrimp trawling by motorized boats, they decided to introduce a self regulatory mechanism for management and an organization called "Chilaw 3.5 t Motorized Boat Fishermen's Welfare Association (CMBFWA) was formed on July 28, 1985. This Association is not registered with any other organization. Its area of operation is the sea adjacent to the Chilaw Urban Council limits including the fishing villages, Aluthwatte, Wattakkalliya, Pitipana, Suduwella and Egodawatte. The main objectives of the Association are:

- (i) to manage trawling in the area by orderly exploitation and
- (ii) to prevent any obstruction to other methods of fishing.

The self-regulatory mechanism is based on the following rules:

- (i) These rules should be followed by all 3.5 t boats operated in Chilaw sea for shrimp trawling.
- (ii) 3.5 t boats engaged in trawling shall leave the base only after 5.00 hrs.

- (iii) Trawling for the second time on a given day is completely prohibited.
- (iv) Exploitation of resource on Sundays and "Feast Days" is completely bane.
- (v) No one shall engage in shrimp trawling for any festival except for a wedding with the permission of the President-Secretary of the Association.
- (vi) Fishing in the lagoons of Pambala and Chilaw is completely prohibited.
- (vii) An active fisherman from a traditional fishing family in Chilaw can operate up-to two (02) 3.5 t motorized craft for shrimp trawling.
- (viii) An active fisherman not descending from a traditional fishing family in Chilaw, but resident in Chilaw town, can operate one 3.5 t motorized boat for shrimp trawling.

This clearly indicates that the resource users themselves are involved in the management. What is more important is that the resource users have initiated the management process on their own. The driving force for initiation of this process was the increasing incidence of conflicts among various resource users due to haphazard operation of 3.5 t boats for trawling.

Trawling, if not properly organized can lead to degradation of the ecosystem. Therefore, it is important that the fishermen themselves initiated the management process. It is for this reason that the trawl fishermen have been able to continue this fishery up to now inspite of strong opposition from small-scale fishermen.

Prior to the formation of CMBFWA, shrimp trawling was disorganized. The fishermen operated trawl nets without any limitations and there were many incidents where three boats damaged beach-seine nets and trammel nets of fishermen using artisanal craft. In addition, they were trawled in the close by Pambala lagoon. The trawling activities have been more effectively managed with the formation of the CMBFWA.

For example in 1987 a member of CMBFWA, who was entitled for the operation of one 3.5 t boat, operated an additional boat; this was stopped by the collective effort of all other members.

With the change of Government policy for the establishment of village level FCSs in 1989. Some members of CMBFWA have joined the Aluthwatte Fisheries Cooperative Society Ltd (AFCS); the President of CMBFWA and AFCS was in fact the same person. Both organizations are functional at present although CMBFWA does not have a legal status and moreover, it represents only fishermen engaged in shrimp trawling. The membership village level fisheries cooperative societies covers fishermen engaged in all types of fishing. In spite of this constraint, CMBFWA has contributed substantially to the management of the resources.

### 1.5 Criteria to Promote Community-Based Resources Management Systems

Effective management of resources depends on conducting surveys and undertaking studies on stock assessment as early as possible moreover, before introducing legislation for management, adequate dialogue is necessary for to ensure participation at grass-root levels. This type of dialogue with all concerned parties can lead o community-based self-regulatory approaches which are effective in managing the resources and protecting the environment.

In cases where over-exploitation is evident, action should be taken to redeploy fishermen to other areas and-or in other sectors. It is, however, a difficult process.

Village level fisheries coperative societies should be strengthened, with maximum participation. It is comparatively easier for community-based approaches to be formulated and implemented through organizations such as FCS than in the case of individual fishermen.

Infrastructural and other facilities provided by the Government for the fisheries sector should be controlled by the village FCSs so that effective measures can be taken by the FCS in specific aspects of resources management. For example, if an FCS controls the fishery harbours or ice plants, these facilities can restricted to the specified number of fishing craft permitted to operate under a given management regime.

### 1.6 Constraints and Future Issues

For a country such as Sri Lanka, where coastal fishery resources are exploited close to maximum sustainable levels, it is essential that management measure are taken. But several constraints are faced.

A major constraint is the lack of accurate an up-to-date information on the available resource. The last stock assessment was done in 1978'1980. To effectively manage the resources, a clear picture of the resources, area wise is necessary. Without thus, it is difficult to convince the resource users regarding the need for limitations of fishing effort.

For many fishermen, fishing is the only source of income. there are also many subsistence fishermen. It is difficult to enforce regulations in such situations, even through self-regulatory approaches.

Lack of adequate extension programmes to educate fishermen on the importance of sustainable exploitation of resources is another constraint.

Many active fishermen are employed by boat owners, who are not interested in conservation of resources. Most of these owners works as "remote agents" away from actual fishing areas.

Fishing effort is presently concentrated in the coastal inshore area. Therefore, the Government policy is to shift the fishing pressure to the offshore and deepsea areas. Subsidies on capital inputs are provided to develop this fishery. Lack of information on fishing grounds and exploitable stock is another constraint in developing this fishery.

## 2. CASE STUDY 2 - BEACH SEINE FISHERY AT WATHUREGAMA

### 2.1 General Description of the Fisheries

Beach seining is an old method of fishing still practised in the coastal waters of Sri Lanka. In the late 1950s this fishery contributed about 40% of the total annual fish landings in the country. In recent years with the introduction of other, improved fishing gears and new technologies, beach seine production has dropped to around 6% of the total harvest.

Wathuregama is a small beach seine fishing village situated in the Balapitiya Fishery Inspector's Division in the Galle District, which has a total fishing population of 14 800 and 2 871 fishing households. So far 3 789 members of the fishing community in the Galle District have been formed into 56 FCSs which are the basis for the community based resource management. There are 112 beach seiners registered in the Galle DFEO Division.

Wathuregama fishing village is about 30 km north of Galle and has formed a Fisheries Cooperative society with 50 members who are all beach seine operators.

Traditionally, the coastal resources of the Galle District were harvested mainly by the beach seines and to a limited extent by gill nets operated by traditional dugout canoes. However, production in the Galle district has increased considerably from 8 000 mt in 1980 to 12 000 mt in 1990, reflecting the development of a purse seine fishery which is an efficient technique for catching small pelagic. Beach seine operations in the Wathuregama area are carried out from October to April as the south-west monsoon makes sea conditions rough and unsuitable during the rest of the year.

Figure 3 illustrates the usual form of beach seine operated in Sri Lankan waters. The average beach seine in the south-western region measures about 2-3 km in extent with the length of the rope varying from 1 - 1.5 km. The body and the bag or the cod end measures around 7 m. the ropes are made of coir fibres whereas wings are made of coir rope meshes and kuralon meshes. The bag is totally made of kuralon.

The net is set in water with the use of a wooden craft (8 m in length) which is known as "Madel Paruwa". The area identified by the Wathuregama fishermen as suitable for beach seining relates to one specified area of beach and the adjacent waters, the exclusive use of which is leased by the Government to net owners. At this place, there are 20 beach seines and 20 "Model Paruwa". These twenty nets are operated on rotational basis as there is only one area of beach ("padu") of 777 m.

The beach seine craft is paddled by four oars, two on either side and each oar is paddled by two men. In addition, there are two men in the craft to set the net and a leader to make all directions and coordinating activities. About 75 men are involved in each fishing operation. Of these, around 40 are from the fishing community and 35 are hired from outside on a daily paid basis (Rs.90/- (US\$ 2) per day, inclusive of bus fare, and some fish to take home).

There are two quite different methods of operating beach seines:

- (1) "Blind" seining, ie. the net is hauled 2 -4 times a day.

- (2) Seining shoals" ie. fish are sighted by an experienced fishermen by sitting on the beach or on a tree and then the net is set.

At Wathuregama padu, the net is generally set blindly 3-4 times a day and hauling is done by about 70 men, 35 on each side. The complete setting and hauling operation usually takes 2-3 hrs.

Once the net is hauled the catch is quickly sorted into varieties and the fish is auctioned at the beach. The catch is usually composed of around 50 species of fin fish and shell fish. The catch consists mainly of small pelagic like clupeids, engraulids and Leognathids. Medium sized pelagic like *Sphyræna* spp., *Chirocentrus* spp., *Rastrelliger* spp., *Scomberomrus* spp. and carangids are also taken.

Once the catch is auctioned at the beach, it is taken to a lorry in wooden boxes each carrying 30 kgs. At Wathuregama, the each seine owners often take loans from the middleman during the off-season and hence are compelled to sell their catch to the same buyer even if he quotes a lower price for the fish.

## 2.2 Demarcation and Legal Framework

There areas along the coast of Sri Lanka which are suitable for beach-seine operations have been identified and registered a "Waraya". A list of such "Madel Waraya" and their demarcation was officially published in a government gazette in 1985.

The Wathuregama "Madel Waraya" which belongs to the Balapitiya Fisheries Inspectors's Division has model paduwas. This madel waraya is demarcated at a distance of 1.5 nautical miles seawards, a length of 777 m length of foreshore area and an extent of 68. m of foreshore landwards.

## 2.3 Involvement of Resource Users in Management

The Wathuregama "Waraya" at present has 20 beach seines and 20 beach seine craft ("Paru"). Some 40 families in the community own the beach seines and boats. Traditionally, the fishery operations carried out at the "Waraya" are managed through a rotarian System by the community themselves. Each beach seine has a number and is operated once in 20 days.

On the day assigned to each beach-seine, the owner can carry out any number of operations, usually 3-4. Traditionally the sons of the family inherit the beach seine craft and gear from the father. If there is more than one son, the eldest owns the crafts-gear and the others get an equal share from the catches. If there are no sons, the marriages of the daughters are arranged within the community in such a way that the son of a family which does not possess a beach seine is married to a daughter owing a beach seine. New generations are allowed to introduce more beach seines if they can afford to buy only with the approval of the community. In 1950 there were only 6 beach seines in the community but although the increase in the number of seines reduced the number of operating days for each existing beach seine, no conflicts have so far arisen as the members of whole community consider themselves to be one family.



Sometimes, a person may own more than one craft. When both the craft and gear are owned by one person, the earnings from the catch goes to him. If a person owns only a beach seine but not a craft, he is not allowed to hire a craft but instead he may lease his beach seine to a person who owns a craft. Thus, it is always the owner of craft who hire beach seines. When a seine is hired, 3/8 of the total income is given to the owner of the seine and the balance to the craft owners.

The Madel fishermen in the Waturegama Waraya traditionally migrated to the east coast during the southwest monsoon. However, since early 1980's, with the security problems in the east, they have ceased to migrate during the rough sea conditions. Instead, some members of the community seek labour in the multi-day fishing boats in adjacent areas. Other beach seine warayas in adjacent areas such as Haraspols and Mankadawala carry out other fishing operations with beach seines. At Wathuregama, natural factors have prevent the development of other fisheries as the beach is not suitable for landing any other craft. Therefore, the community in Waturegama depends entirely on the beach seine fishing operations which they are managing themselves quite successfully.

#### 2.4 The Need to Promote Community-Based Resources Management

The coastal resources in Sri Lanka are common property or open access resources. Without management, competition among resource users may result in over-exploitation of the resource, negative environmental effects and other constraints such as equity problems and loss of social welfare. In an open access resource, no one individual owns the resource or controls its management.

The Government of Sri Lanka has introduced regulatory management tools such as licensing, permit systems etc. to try to control and manage certain fisheries. The use of such regulatory tools alone has not been very successful. With the increasing number of user conflicts the lack of effective management is creating many social problems.

Although most of the coastal fishermen are aware of the state of the resource, especially where the stocks are depleting, competition among the fishermen and the nature of the common property resources has led them to continue fishing even for low economic returns. This has made certain fishing communities more and more poor. However, it is envisaged that the further establishment of fishery cooperative societies at the village level will enable communities to lead role in the management of the resources fished by their members.

#### 2.5 Conclusions and Future Issues

In Sri Lanka the coastal fishery are a most important subsector accounting for over 90% of total production and employment and almost 100% of total foreign exchange earnings. The main objectives of the national fisheries development plan for the period 1990-1994 is to increase fish production in order to raise the nutritional status of the population through a high per capita consumption of fish and to promote the rational and optimum exploitation of the aquatic resources based on the application of modern science and technology.

Before the mechanization of the fishing industry in 1950s, coastal fish production was primarily from beach seines. The increases achieved in fish production since then have been mainly attributable to the use of mechanized craft and synthetic netting. The introduction of new technology has led to conflicts between beach seiners and the users of the introduced craft and gear when exploiting the same resources. In early 1950s, the Government accorded beach seiners special fishing privilege as they contributed the bulk of production at that time. These privileges are still in existence, such as the licensing of "Padus" within which any other kind of fishing activity or landing of any other mechanized fishing crafts is prohibited by law. The development of other fisheries in the same area has resulted in conflicts as the beach seiners claim that the other fisheries in the surrounding area exploit the same resources, thereby resulting in a decline in their catches.

In the Balapitiya area, a purse seine fishery is developing for small pelagic such as sardine, Indian mackerels, Scad Mackerels etc. The beach seine operators claim that, because of the activities of the purse seiners, that their catch rates have declined and this has now become a threat to the whole beach seine fishery. However, the beach seine is an inefficient fishing device when compared to active fishing gears as it relies entirely in the movement of fish shoals in to the inshore seinable waters. If the Government objective of increasing fish production is to be achieved, resources will have to be exploited to the optimal level. A major issue now is whether to retain the benefits and privileges given to the beach seiners and/or to encourage other fisheries in the inshore-waters so as to increase the fish production.

Figure 1 Map of Sri Lanka showing the maritime boundaries

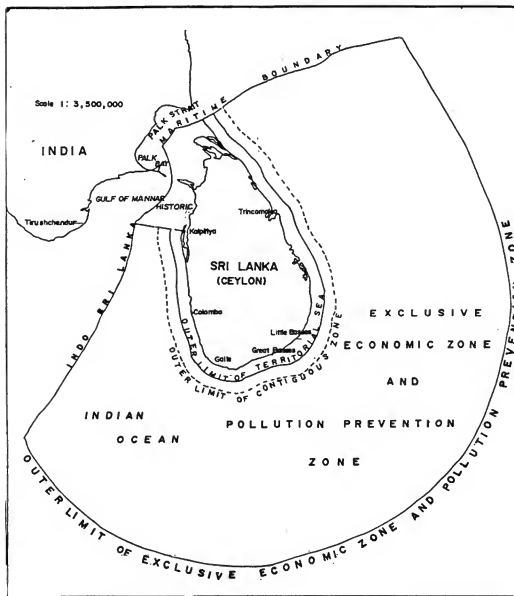


Figure 2 Map of the west coast of Sri Lanka showing the locations of the two case studies

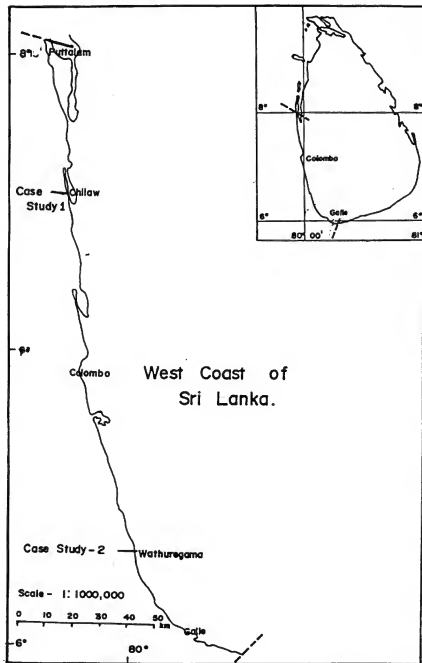
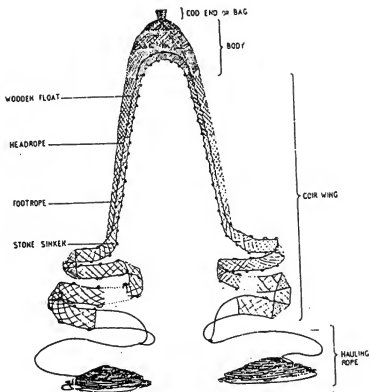


Figure 3 A schematic drawing of a Beach seine operated in Sri Lankan waters



## SOCIOLOGICAL CONSIDERATIONS IN TERRITORIAL USE RIGHTS IN FISHERIES

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### ABSTRACT

In the Philippines, the existing fisheries legislation distinguishes between commercial and municipal fisheries solely on the basis of the tonnage of the individual vessels involved; commercial fisheries are simply defined as those in which vessels of 3 GRT or more are used. These fisheries are under the jurisdiction of the central government while municipal governments are responsible for the coastal small-scale and subsistence fisheries. There is thus no comprehensive system for resource use, management and sustainability. In the municipal fisheries as compared with the commercial sector, no licences are generally required, vessels being simply registered for purposes of ownership identification. As a result, the coastal fisheries are exploited in an open access situation, leading to excessive effort and poor socio-economic conditions among the coastal fishermen. The paper calls for the more efficient and equitable use of the coastal fishery resources by the award of exclusive fishing rights to fishermen's cooperatives. Noting the success of such a system in Japan and Korea, the paper describes the socio-economic and resource conservation benefits that could arise from such a revised legal and institutional framework for the fisheries. Among the major advantages would be the self regulation and enforcement possible through such a community approach, in which social sanctions effectively replace legal penalties imposed from above. The government would need to revise existing fisheries legislation and to continue to provide support services, infrastructures, credit and extension, etc.

### 1. INTRODUCTION

The social conflicts which have developed between the Philippine small-scale fisheries and the commercial fisheries sectors over the years may be traced from the national organic laws that have been enforced which in effect exacerbated excessive fishing effort, particularly in municipal waters.

The Republic Act 4003, which was promulgated in 1932 as amended, has been the basis of fishery administration in the Philippines. This Act was superseded by PD 705 in 1975 but the latter carried the same classification of fisheries into commercial and municipal fishery. Neither act provides a system of resource use and allocation which safeguards the sustainability of resources and at the same time improves the socio-economic conditions of coastal fishermen.

The only distinction between the two categories of fishery is the tonnage of fishing vessel which is 3 gross tons regardless of whether it is powered or non-powered. This

classification continues in use despite the advances in marine fisheries attained over the last 60 years.

Commercial fishery, as defined in this Act as amended, is a fishery which uses fishing boats of 3 gross tons or more while municipal fishery involves vessels of less than 3 gross tons or without using a fishing boat.

The commercial fishery is directly under the jurisdiction of the national government through the Bureau of Fisheries and Aquatic Resources (BFAR). On the other hand, the municipal fishery is under the jurisdiction of municipal governments scattered all along the coastline. Local fishery regulations established by municipal governments have, however, to be approved by the Department of Agriculture through the BFAR.

## 2. LICENSING AND REGISTRATION ISSUES

This situation creates a number of difficulties. In the first instance, there is the question of who monitors whether the 3 gross tons borderline between municipal and commercial fishery is observed by both the BFAR and the municipal government. The borderline of 3 gross tons may not be an adequate criteria as basis for separate management and development policies for small scale fisheries and commercial fisheries. It is obviously difficult to manage these fishery sub-sectors under two different administrative institutions which have very little direct linkage with each other. Commercial fishing vessels can, moreover, operate within municipal waters provided they pay corresponding taxes or fees to the municipality concerned and obtain the necessary license.

In fact, the basic consideration for licensing of fishing boats and issuance of permits appear to be revenue generation. There is no limitation on the number of fishing boats to be licensed as long as the criteria required for obtaining a license are met. The consequence, therefore, is an increase in number of fishing units.

In the case of municipal fishery, most of the fishing boats used are wooden dugouts with or without engine. These are registered for purposes of identification of ownership but in general no license for fishing is required. Any person who is not licensed to engage in commercial fishing is allowed to fish for home consumption in any municipal water, provided the area is not under concession and no communal fishery is established. However, no fishing is allowed within 200 m from a fish corral licensed by a municipality; moreover no fish caught may be sold. Through this provision of PD 704, subsistence fishing is simply left to its own devices. Considering that the amount of subsistence or municipal fishery is significant, there should be legal support to improve socio-economic conditions.

The basic national fishery law does not provide a system of resource use and allocation to qualified fishermen. Under these circumstances, only those with adequate resources are able to obtain licenses to fish, to put up fishponds, obtain fry concession or erect fishpens or fish corrals, etc. This leaves the thousands of artisanal fishermen in a difficult position.

### 3. THE SITUATION OF COASTAL FISHERMEN

The great majority of coastal fishermen are simply allowed to operate their traditional family practices in competition with the commercial fishery operators who are licensed. There is no restriction on entry fishery which is considered a common property and operated in and open access nature. No limits on fishing are imposed as long as licenses or permits are issued. There is no control on the number of fishing boats, fishing gears used and fishing grounds exploited. Any person can acquire his own fishing gear and a fishing boat can go fishing, with or without a license, particularly in shallow coastal areas.

From the beginning, licensing procedures, in whatever form have not been used for resource management but for revenue generation because fishery is a state patrimony. Therefore, to users the fishery resource, the fishermen must be licensed. This license, however, is not applied to all users of fishery resources. The coastal fishermen are not taken into account because they are regarded as small-scale and subsistence in nature. On the other hand, they comprise the majority of users and are poor in contrast to the commercial fishing sub-sector.

As a consequence of this disparity of socio-economic circumstances between the commercial and municipal fishing sub-sectors, conflict have arisen due to intense competition for the use of the same resources.

The above situation underlines the lack of specific provisions of law on how and to whom coastal fisheries should be allocated. Coastal fishing is a major occupation of fishing households all along the coast of the Philippines. Considering that almost 50 % of the total fish production comes from the municipal fishing sub-sector, it is imperative that a system of resources use and allocations be established by law to better control fishing effort and promote the socio-economic improvement of the municipal fishermen.

### 4. RESOURCE USE AND ALLOCATION SYSTEMS

Fisheries management encompasses not only the biological aspects of the resource but also socio-economic considerations. Unlike farmers, fishermen do not own sea areas where they operate nor do they own the fish stocks therein.

Fishing is a traditional occupation of households in the coastal areas. The Philippines is composed of over 7 000 islands which are dotted with fishing communities. Nearly a million people derive their livelihoods from municipal fisheries. The contribution of municipal fisheries to national fishery production is substantial. However, the economic benefits of such contribution does not seem to be evident in the fishing communities which are in poor socio-economic conditions. The unlimited entry system of fishery management exacerbates the poverty of coastal fishermen. The coastal fishermen, on the other hand, do not have a community framework by which they could be considered by the government as a distinct sub-sector of the entire fishing industry in the same manner that the commercial and aquaculture sub-sectors are given attention and support by the government. A more appropriate system of resource use and allocation of coastal fisheries is needed to improve the socio-economic conditions of the municipal fishing communities. A limited entry system into the fishery by adopting a system of fishing rights and licensed fisheries should be established. The procedure and mechanics for such a system should be made by law.



Under this system, equitable resource use and allocation of municipal and commercial fisheries could be implemented. Municipal fisheries should be granted exclusive fishing rights by the respective local governments in accordance with the state of resources and technical information from the national government. Coastal fisheries throughout the country should be under exclusive fishery rights granted to fishermen's cooperatives or cooperative associations. Such fishermen groups could then provide the organizational structure for the coastal fishery industry and in effect serve as the implementing arm for resource management with whom the national or local government authorities would deal with. The fishermen groups, cooperatives or associations could become the dialogue partner of government in matters relating to resource sustainability and production.

Once the municipal fishery sub-sector is thus organized, these would be more favourable conditions for implementation of government policies on resource management and development. The fishermen would have better perception of their common problems and the need for sharing responsibilities in the rational use of resources within their respective communal areas through the democratic processes of fishery cooperative organizations. Improvements in the socio-economic status of their households could be obtained faster.

## 5. THE NEED FOR INSTITUTIONAL SUPPORT

As an individual, a municipal fisherman does not have sufficient resources of his own to complete with the commercial fishing operations. Studies have shown that the economic status of municipal fishermen nationwide is one of extreme poverty. Over the period 1977-1986 the average annual catch per fishermen increased only from 1350 kg to 1587 kg while the average household income per month ranged from P174 to P4873 according to the region (See Table 1) at the same time, the number of fishermen, considerably increased, from 500,000 in 1977 to 675,000 by 1986.

Under these circumstances, municipal fisheries have to be managed differently compared with the commercial sub-sector. Municipal fishery (small scale, coastal) should be defined as a fishery which is mainly undertaken with family members of the fishing operator's household to maintain their family needs; commercial or industrial fishery is one which is carried out with hired fishermen and the operator wishes to make profits out of the fishing operations.

The municipal fishery sub-sector, being family operated in general, needs institutional development support to promote socio-economic well-being. The granting of fishery rights solely to fishery cooperatives and associations appears to be a logical solution. This approach has made coastal fishery in Japan and Korea very strong sectors of the fishery industry. Through this institutional framework of coastal fishery in Japan, the socio-economic conditions of the fishing households were improved and the level of their incomes, now comparable to that of farm households, is higher than salaried household incomes in urban areas.

The sociological rationale for the organization of municipal fishery cooperatives is summarized in Figure 1.

## 6. SOCIO-ECONOMIC ADVANTAGES OF FISHERY RIGHTS

Fishery rights granted to groups of fishermen such as cooperatives or associations offer the possibility of assigning exclusive use-rights for specific resources and/or fishing areas to fishermen whose livelihood depends entirely on the coastal resources. Control by fishing communities with over these rights provides the means by which the socio-economic welfare of these communities could be improved.

By virtue of the fishery rights granted to fishing communities, the coastal resources can be better managed as the fishermen control their own activities; they decide what they should do about their resources for their long term benefit. Fishery cooperatives or associations thus tend to make management decisions in favour of conservation.

There will be no need to employ fishery wardens or outside agents to enforce rules and regulations. The fishermen agree among themselves what regulations to adopt. Social sanctions are far more effective than legal sanctions, particularly in small fishing communities. Violators of the rules and regulations will be discovered and censured isolation in the fishing community, loss of face and reputation are sufficient safeguards to ensure compliance. Fishery rights, therefore, are administratively feasible with minimal cost to the government.

Fishery rights give local fishermen a certain degree of political acceptability and power in the sense that such rights granted to fishery cooperatives are inalienable for the simple reason that fishermen supply food to the populace. Food self-sufficiency takes precedence over any other priority. On the other hand, fishery rights could be cancelled by the government should there be non-compliance with the terms of rights.

## 7. GOVERNMENT SUPPORT TO FISHERIES MANAGEMENT AND DEVELOPMENT

In order to promote the socio-economic improvement of coastal fishing communities, government support is essential. Government programmes must therefore support the fishermen; otherwise, their productivity suffers if the inputs necessary for production are not provided. Such government inputs includes:

- (a) Infrastructure (i.e. fish landing/market facilities/ storage).
- (b) Institutional support (i.e. credit/finance: research and extension; insurance; legal support; fishery information; etc.)
- (c) Technical evaluation and monitoring of fisheries.

The above inputs are the basis for government funding of national and local fishery development programmes which should strengthen fishery production activities.

Fishery cooperative associations which are awarded exclusive fishing rights serve as non-governmental organizations which directly implement government fishery development programmes. There is no need for intermediary interventions of private non fishery NGOs since the management body of each fishery cooperative association functions as the governing

body of fishermen. These cooperatives are accountable to their members and their respective governing bodies are responsible to the government for implementation of their respective fishery rights. These rights can be reviewed by the government every five years or so depending on the tenure of rights granted.

Fishery rights, therefore, are the bond between fishermen and government in the implementation of fishery management and development programmes and policies.

## 8. CONCLUSIONS

There are several bills in consideration in the Philippine legislature, both in the Senate and Congress. The Bureau of Fisheries and Aquatic Resources should take an active role in redrafting the Fisheries Code, S.B. 1354, consolidating all Laws on fisheries, and the other bills directly related to fisheries in order to establish appropriate resource uses and allocation systems. The mechanics of implementation of the systems should likewise be spelled out, particularly with reference to the Local Autonomy Code.

Furthermore, legislation for the establishment of fisheries cooperatives associations should be elaborated. While there is a Cooperatives Development Act, this is general in nature and does not fit the requirements of fishery management and development. Such legislation would provide a community framework for fisheries which will have greater socio-economic impact on coastal fishing households.

A close cooperation and coordinations between the national and local governments with regards to fisheries management and development is essential in order to maintain the sustainability of fisheries as a major source of food and livelihood.

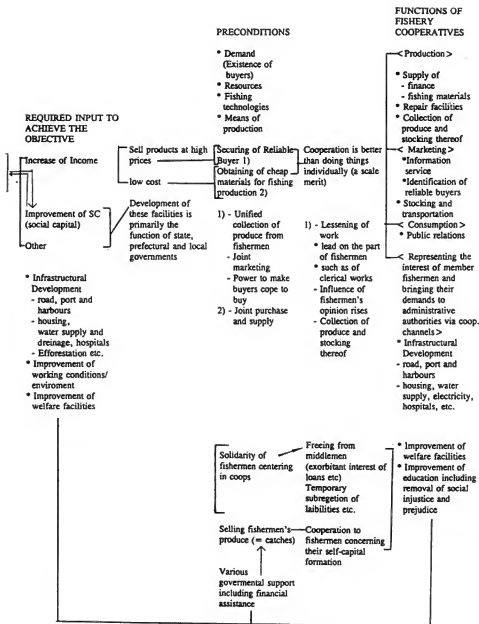
Table 1

Household Income per Month

REGION	(P)
I	493
II	780
III	625
IV	4,873
V	1,529
VI	3,322
VII	504
VIII	686
IX	4,133
X	2,614
XI	174
XII	2,248

Source: AGRODEV, 1988.

Fig. 1 - Necessity for Fishery Cooperatives



## THE ECONOMIC MANAGEMENT OF CANADA'S PACIFIC FISHERIES AND THE PROSPECTS FOR DECENTRALIZED CONTROL

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### ABSTRACT

Although the management of Canada's Pacific coast fisheries does not presently include community-based systems, experiences with centralised resource management programmes are now encouraging experimental approaches which might eventually lead to the devolution of management rights and responsibilities to the fishermen. Reviewing the problems involved in centralised control, the paper discusses situations and issues that arise when fishery resources are regarded as common property and then traces the steps taken to limit entry to the British Columbia fisheries. Measures included the introduction of strict licensing in the salmon fishery in an attempt to reduce excessive competition; however, there was still intense competition for shares of the valuable resource and every incentive to circumvent the regulations. Attention then turned to alternatives involving the creation of some form of property rights, in particular individual harvest quotas, either as an amount or a percentage of a seasonal Total Allowable Catch. Positive results have been obtained in introducing experimentally such quota schemes, first to abalone and clams and later to halibut and sablefish. Area licensing schemes, which also create property rights, have been put in place for other fisheries, notably one class of salmon fishery and the roe herring fishery. The paper notes that, while these new forms of management have produced initially encouraging results, there is evidence that such innovations encounter opposition from vested interests that have emerged under existing management regimes.

### 1. INTRODUCTION

One would search in vain on Canada's Pacific or Atlantic coasts for serious attempts to establish community-based resource management systems. What one does have in Canada's Pacific fisheries, however, are vivid examples of the problems arising from centralized management control and evidence that the management authorities are giving thought to newer management regimes that could in time lead to the devolution of management power from the government to groups of fishermen. Evidence exists as well, however, that shifts to these newer forms of fisheries management will encounter vigorous opposition from vested interests that have emerged under the existing management regime.

## 2. AN OVERVIEW OF CANADA'S PACIFIC FISHERIES

One of Canada's ten provinces, British Columbia accounts for Canada's entire Pacific coast. The British Columbia fisheries, in contrast to those of Atlantic Canada, are largely inshore and near shore in nature. Of these inshore/near shore fisheries, the salmon fishery is dominant, followed by a herring fishery as a distant second. This is made evident in Table 1 which shows the value of landings for 1989.

Table 1: Landed Value of Harvested Fish\* by Species  
(British Columbia - 1989)

SPECIES	VALUE CANADIAN \$ (million)	% OF TOTAL VALUE
SALMON	220.1	52.9
HERRING	76.3	18.3
SABLEFISH	19.0	4.6
HALIBUT	18.7	4.5
OTHER GROUND FISH	33.3	8.0
CRUSTACEAN & MOLLUSCS	42.1	10.2
TOTAL	416.3	100.0

Source: Canada, Department of Fisheries and Oceans, Canadian Fisheries Statistical Highlights, 1989, Ottawa, 1991

- \* These figures exclude aquaculture harvests

The dominant Pacific salmon species, consisting of five sub-species, is anadromous in nature. The fish are produced in freshwater habitats, move to salt water where they spend most of their life cycle, and then return to the freshwater habitats in which they were produced, to spawn and die. The salmon are normally harvested at sea as they approach the river mouths to make their final journeys. The harvesting fleet consists of several thousand small vessels, divided among seiners, gill netters, trollers and combination vessels.

Harvesting salmon is relatively easy. Moreover, the unit value of the fish is high. The fishery should, therefore, be wealthy. This, however, is not the case. The good years, in economic terms, have been limited. Crises have been frequent. When one takes into account the costs to government of managing the resource, one would have to conclude that there have been few years in which the fishery has made a positive contribution to the Canadian national income.

What is true of the salmon fishery is true of the herring fishery and the lesser fisheries in British Columbia waters. In the late 1970s, the Canada Federal Government established a commission led by a natural resource economist, Dr Peter Pearse, to review all aspects of Canada's Pacific fisheries and to provide

recommendations for improving management (Canada, 1982). Dr Pearse's final report in late 1982 commenced as follows:

"We begin with a paradox. We have some of the world's most valuable fish resources, they are capable of yielding great economic and social benefits; yet many commercial fishermen and fishing companies are near bankruptcy, sport fishermen and Indians are preoccupied with declining opportunities to fish, and the fisheries are a heavy burden on Canadian taxpayers."

This paradox has its basis in the common property nature of the British Columbia fishery resources.

The economic problems arising from the common property aspects of fishery resources are not unique to British Columbia, or indeed to Canada. On the contrary, the problems are all but universal, applying with equal force to developed and developing coastal states alike.

In light of the fundamental importance of the common property aspects of fishery resources to the discussion which follows, it is appropriate to digress briefly and review these aspects and the economic problems to which they give rise.

### **3. FISHERY RESOURCES AS COMMON PROPERTY: A DIGRESSION**

Fish are generally not observable except upon capture and, with the exception of shellfish perhaps, are subject to extensive movement. It has, consequently, usually proven very difficult for a state to assign property rights to fishery resources, as it might to, say, agricultural land, forests and other natural resources. Economists have, for almost 40 years, argued that the common property nature of the resource can lead to severe economic problems. It proves useful to divide these economic problems into two classes. The Class I Common Property Problem arises when a commercially valuable fishery is harvested by competing fishermen and is subject to no regulation or control whatsoever. Harvesting invariably leads to excessive depletion of the resource and can, in some instances, lead to near extinction of the resource, at least in a commercial sense. Individual fishermen have little or no incentive to conserve the resource. The fisherman who refrains from harvesting in order to conserve the resource is likely to find that he has done nothing more than enhance the harvesting prospects of his competitors.

The British Columbia fisheries provide several examples of this Class. When extensive commercial harvesting of salmon began in British Columbia in the late 19th century, the authorities felt compelled to take immediate action to control the harvests, even though British Columbia was underdeveloped and the salmon fishing fleet was small. It was clear to the authorities that unregulated harvesting could lead, not merely to the depletion of the salmon resource, but to its outright destruction.

In the late 19th century, and the first part of the 20th century, the second most valuable fishery in British Columbia was the halibut fishery. The resource, which was and is shared with the United States, is not as vulnerable as Pacific salmon. Nonetheless, by the early 1920s, the Canadian resource management authorities, and

their counterparts in the United States, concluded that radical international resource conservation measures were required if disaster was to be averted. The result was a Canada-USA treaty and the eventual establishment of the International Pacific Halibut Commission to manage the resource.

The Class II Common Property Problem arises when the management authorities do take steps to conserve the resource by controlling the total harvest, but do nothing to control the size of the fleet taking the limited harvest. The inevitable consequence is overcapitalization of the fleet leading to economic waste and the dissipation of the contribution of which the fishery is capable of making the national income. Individual vessel owners, upon entering the fleet, will have no impact upon the total harvest, if the authorities are effective. They can, however, expect to compete for a share of the valuable limited harvest - hence the incentive leading to overcapitalization.

Both the aforementioned British Columbia halibut and salmon fisheries provide examples. Consider the halibut fishery first.

The joint Canada-US efforts, commencing in the 1920s, to conserve and rebuild the Pacific halibut stocks appeared to be successful. These efforts were unquestionably assisted by the Great Depression of the 1930s and World War II, both of which inhibited harvesting.

With the conclusion of World War II, however, the inhibitions to harvesting were removed. The authorities succeeded in maintaining the stocks, but a Class II Common Property Problem emerged and became starkly evident.

The management approach taken was common for regulated groundfish fisheries throughout the world. For a given season, the authorities would establish a seasonal Total Allowable Catch (TAC). Once the TAC was taken, the fishery was closed until the next season.

In the halibut fishery, the emergence of redundant harvesting capital manifested itself through steadily shorter seasons leading to vessels being under-utilized, for increasingly greater portions of the year. In the early 1930s, the season length averaged approximately 33 weeks per year. By the late 1980s, the annual season was reduced to less than two weeks.

The waste in vessel capital was accompanied by waste in the processing sector as well. Instead of there being a supply of raw fish spread evenly over the year, the annual supply was concentrated over a very short period of time leading to extensive storage costs and quality problems.

A similar situation emerged in the Pacific salmon fishery. If anything, the problem emerged earlier and became more glaring than that in the halibut fishery. The authorities took measures to correct the situation in the late 1960s. Yet, a decade later, it was being argued that the Pacific salmon fleet, at a minimum, had twice the capacity required to take the allowed harvests.



Finally, it should be emphasized that the Class I and Class II Common Property Problems are not mutually exclusive. If the management authorities permit a Class II Common Property Problem to emerge, they will find that their attempts to conserve the resource will be that much more difficult. Chronically unsatisfied vessels and vessel owners will greatly exacerbate the policing problems of the authorities.

#### **4. ADDRESSING THE COMMON PROPERTY PROBLEM: PROGRAMS OF LIMITED ENTRY**

The necessary measures to deal with the Class I Common Property Problem seem obvious enough. The management authorities should implement measures to restrict total harvests. In this, the management authorities responsible for Canada's Pacific coastal fisheries have been reasonably successful. It has now been seen, however, that if further measures are not taken, attempts to solve the Class I Problem can lead directly to the Class II Problem. The Class II Problem, by way of contrast, has proven very difficult for the aforementioned authorities to resolve. It is their attempts to deal with this problem that has led the authorities to consider measures which could lead ultimately to greater management control being placed in the hands of fishermen.

Reference has been made in passing to the authorities' attempt to address the Class II Common Property Problem in the Pacific salmon fishery, commencing in the late 1960s. The solution appeared to be straightforward. If the salmon fleet was excessive, then obviously the first step would be to find means of reducing the existing fleet. This fleet reduction policy should be accompanied by one of restricting entry to the fleet to ensure that the fleet did not grow back to its former size.

The Canadian fisheries management authorities acted accordingly and thereby introduced in the Pacific salmon fishery the first major experiment in limited entry programs. The experiment was subsequently to be copied many times in various parts of the world.

The Canadian authorities imposed strict licensing requirements on the fleet, which had the immediate effect of phasing out part-time fishermen. Those remaining could participate only if their vessel was properly licensed. A new vessel could be introduced into the fleet, if and only if, a license was acquired from an existing vessel. The vessel from which the license was stripped was forced to leave the fleet. Thus, the introduction of new vessels into the fleet did not increase the fleet's size.

The license limitation program was accompanied by a buy-back program. Fishermen were encouraged to sell their vessels to the government. The vessels sold to the government, along with their licenses, were eliminated from the fleet. Thus, the fleet would decline over time, and overcapitalization would vanish, or so it was hoped.

By and in the large, the experiment proved to be a disappointment. The comment, referred to earlier, that the salmon fleet in the early 1980s was at least twice as large as that necessary to take the allowable harvest, was made after the licence limitation program had been in existence for over 12 years. The problem lays with incentives and market signals.

Economists like to argue that common property leads to so called market failure in the sense that the market sends out incorrect signals, leading to over-exploitation of the resource and/or the emergence of redundant capital in the fishery. The resource management authorities can respond to this situation, either by attempting to prevent the participants in the fishery from responding to the undesirable signals, or by changing the market signals themselves.

The license limitation program fell into the first category. The market continued to send out the signals typically found in a Class II Common Property Problem. The fishermen continued to have the incentive to compete for shares of the limited and valuable harvest and consequently had every incentive to attempt to circumvent the regulations. Thus, when the program was first introduced, the authorities implemented a "boat for boat" rule. A new vessel introduced to the fleet had to be accompanied by the elimination of an existing vessel from the fleet. Fishermen were quick to eliminate small vessels from the fleet and replace them with larger ones. The authorities then countered with a "ton for ton" rule. If, for example, a 30 ton seiner were to be introduced into the fleet, 30 tons worth of fleet capacity had to be removed from the fleet simultaneously. It became evident that 30 tons of capacity in the form of several small vessels had less catching power than 30 tons of capacity in a single larger vessel. Fishermen became aware of this fact immediately and acted accordingly. The authorities then responded with a "foot for foot" rule, and so it went on.

Fishermen also responded by enhancing the catching capacity of their vessels, whatever the size, through the increase of engine size and the installation of additional gear. A decade after the limited entry program had come into effect, the number of vessels in the fleet has declined significantly. Economists of the time, however, estimated that the amount of capital in the fleet had actually increased.

The experience with the Pacific salmon limited entry program leads this writer to the following conclusion. In this market signal blocking type of exercise, the government administrator and fisherman are necessarily adversaries. In order for the program to be effective, the cleverness of the administrator, in designing the regulations, must at all times exceed the ingenuity of the fisherman in circumventing the regulations. Invariably, the condition is never met.

The resource management problem faced by the authorities in British Columbia under limited entry was aggravated by the fact that allocations of harvests had to be made between commercial and recreational fishermen and was aggravated further by claims to fisheries rights made by the indigenous people, the North American Indians. The latter issue was made particularly difficult by virtue of the fact that it was intertwined with the broader issue of Indian land claims.

Yet even if the questions of recreational versus commercial fishing and of Indian claims had not existed, the disappointing experience with limited entry programs would have caused the authorities to look to alternative management schemes. The alternative, of course, involves attempting to change the unfortunate market signals, rather than attempting to block the impact of the signals.

The alternative invariably involves the establishment of fishermen property rights in some form. If it is not possible to establish property rights to the fishery resources themselves (which it seldom is), then property rights are created with respect to the harvests.

The property rights may be assigned to individual fishermen or to individual companies. It is, however, not necessary that property rights be assigned on this basis for the approach to work. If a group of fishermen, united by geographical location (e.g. community), or activity, can form a cohesive whole, then the property rights can effectively be assigned to the group, rather than to the individual fisherman. We might, for want of a better expression, refer to property rights assigned to a group of fishermen, as opposed to an individual, as "corporate" property rights.

In British Columbia, the management authorities have been exploring two schemes, leading to the creation of property rights - explicit or implicit. The two are individual harvest quotas and area licensing. The authorities have moved slowly and cautiously in introducing these schemes. Nonetheless, the authorities have, in spite of their caution, encountered considerable opposition.

## **5. ALTERNATIVES TO LIMITED ENTRY PROGRAMS: INDIVIDUAL HARVEST QUOTAS AND AREA LICENSING**

Under an individual harvest quota scheme, the authorities establish in a fishery the seasonal Total Allowable Catch (TAC), or the equivalent thereof, but then proceed to issue harvest quotas to individual fishermen or companies. The quota may be issued in perpetuity or have a finite term. The quota may be expressed as a fixed quantity amount per season or as a percentage of whatever the seasonal TAC may happen to be. Finally, the quota may, or may not, be transferable. There is considerable debate over the characteristics of the optimal system of individual harvest quotas.

In any event, the fisherman or company is given what amounts to a property right to a share of the harvest. With a guaranteed share of the quota, the individual fisherman (or company) has no need to compete for a share of the harvest. Thus, the Class II Common Property Problem is eliminated, or so it is hoped. Moreover, the argument continues, if the individual harvest quotas can be transferred, i.e. sold - or at least leased - then efficiency in the fishery will improve as less efficient fishermen sell their quotas to the more efficient.

Individual harvest quotas have in the past been implemented in some parts of Canada's Atlantic coast fisheries. The scheme has, moreover, been implemented in several countries outside of Canada. Of these other countries, the one which has developed the scheme most extensively is, unquestionably, New Zealand. In any event, the management authorities in British Columbia had considerable experience outside of the province upon which to draw.

The aforementioned authorities began cautiously by first introducing the quota scheme to minor fisheries, such as abalone and clams. In 1990 and 1991, the authorities introduced individual harvest quotas in two groundfish fisheries of at least a moderate importance, halibut and sablefish.

Let the scheme in the sablefish fishery serve as an example. Sablefish (popularly referred to as black cod) is a groundfish with a high unit value. The British Columbia sablefish fishery experienced rapid growth over the 1980s. At the beginning of the decade, the value of landings was approximately Can.\$ 5-6 million. The value of the landings more than trebled by the end of the decade.

While output increased rapidly, the fishery provided a striking example of both the Class II Common Property Program in operation and the weakness of limited entry programs. A limited entry program was introduced in 1981 restricting the number of vessel licenses to 48. In that year, the fishing season was 245 days. By 1989, the fishing season had been reduced to 14 days. Without a change in the management system, the season would have been reduced to 8 days in 1990. The fishermen themselves pressed the authorities for the introduction of an individual harvest quota system. The authorities agreed and introduced the individual harvest quotas on a trial two year basis.

Although the sablefish harvest quota scheme is still at an experimental stage, there are clear signs of success. One sign of the success is that the scheme has provoked a major debate. The critics condemn the scheme, not on the basis that it is unworkable, but rather on the basis that it is making a few fortunate fishermen wealthy, while excluding others from the fishery.

It can be said in passing that the debate is bringing two points to the fore. The first is that when introducing schemes to create property rights for fishermen, the equity issue, or "fairness" argument, cannot be brushed aside. If the property rights, however created, are essentially granted to an existing group of fishermen free of charge, the fishermen may well enjoy large windfall gains. This is certain to cause widespread resentment and can lead to the system being seriously undermined at the outset.

The second point is that, in spite of the obvious economic wastes associated with common property fisheries, such fisheries remain popular with many fishermen. The economic costs associated with such fisheries, particularly those arising from management, are borne by society at large. Consequently, individual fishermen, if fortunate, can still reap substantial positive gains even though society as a whole enjoys negative gains from the fishery.

This raises the question of, whether under a system of individual harvest quotas, the burden of resource management could be passed on, at least in part, to the fishermen. What can be said about the existing individual harvest quota scheme in the British Columbia sablefish fishery, and in all similar schemes in the province, is that the management of the resource remains firmly in the hands of the government management authorities.

Pearse argues on that individual harvest quotas can indeed lead to management of the resources being devolved upon the fishermen. In his report to the New Zealand government, Pearse argues that, by establishing individual harvest quota schemes, the New Zealand government had, whether it had realized it or not, surrendered substantial property rights to the fishermen. Fishermen operating in a fishery with individual harvest quotas are, therefore, much like shareholders of a corporation. Similar to

shares of a corporation, the harvest quotas have values based, not just on current harvests, but rather on the stream of future harvests. As a result, the fishermen are compelled to view the resource as an asset yielding harvests and economic benefits through time.

Consequently, it is sensible to call upon the fishermen to take on much of the responsibility for the management of the resource. The government would not withdraw entirely. Rather the government would lay down broad management guidelines for the fishermen and enjoy ultimate management control.

Pearse emphasizes the responsibility aspect of management. Under his proposal, fishermen would not simply enjoy the benefits of management. They would be expected to incur many of the costs of management as well. While these ideas have yet to be seriously discussed in British Columbia context, it is interesting to note that the critics of individual harvest quotas in British Columbia complain bitterly about the "privatization" of hitherto common property fishery resources.

It is recognized, even by the most enthusiastic supporters of individual harvest quotas, that the scheme will not work in all fisheries. In those fisheries in which it is difficult to monitor landings, or in which the annual harvests are subject to violent fluctuations, experience suggests that the individual harvest quota schemes are not to prove to be feasible. In British Columbia, there are serious doubts about the applicability of individual quotas to the dominant salmon fishery which is subject to wide fluctuations in yearly harvests.

It is this fact which has aroused interest in another scheme designed to alter market signals, namely area licensing. Under an area licensing scheme, a fishery is divided into two or more areas. A licence issued to a vessel owner gives the owner permission to operate the vessel in a single area, rather than throughout the entire range of the fishery.

The scheme is in place in the province's roe herring fishery for one class of salmon fishing and in a collection of small fisheries. It is maintained that, in the roe herring fishery at least, the scheme has been highly successful.

Upon first review, it is easy to gain the impression that the scheme is no more than a modified limited entry system. The theory essentially is that, if the areas are small enough and, if concomitantly that number of vessels in each area is small enough, the fishermen will coalesce and begin to act as a unit.

A popular form of analysis employed by economists, political scientists, legal experts and others in examining situations in which the actions of one participant clearly act upon others, is the theory of games. Game theorists make a broad distinction between those games that are competitive in nature and those which are cooperative. In a cooperative game, as opposed to a competitive or non-cooperative game, the participants, or "players", can communicate effectively with one another. While each "player" is assumed to be striving to maximize his/her own gain, individual "players" may conclude that significant gains are to be made through cooperation.

One characteristic of an important class of competitive game is that "players" are driven, because of an inability to communicate with one another, to adopt strategies which they know to be destructive. Common property problems, both Class I and Class II, have all of the characteristics of such a game. Thus, for example, in a Class I problem, an individual fisherman may be well aware of the destructive consequences of over-exploitation. If however, if the individual fisherman refrains from harvesting, he is almost certain to lose.

It is a common place in the theory of games to note that, the greater is the number of "players", the more difficult it is for a cooperative solution to emerge and to be maintained. With large numbers, effective communication becomes problematic. Furthermore, the larger the number, the easier it is for a member of a coalition to cheat and to go undetected for a lengthy period of time.

Consequently, the proponents of area licensing have a point. With small enough areas, and small enough numbers of vessels in each area, it is possible that a destructive, competitive "game" will be replaced by a cooperative one.

If the theory holds, then, in a given area, the fishermen would begin to act like members of a corporation. In other words, the outcome would resemble a well functioning system of individual harvest quotas. While the fishermen might not have property rights on a *de jure* basis, they would have them on a *de facto* basis. It would follow that consideration should then be given to devolving resource management rights and responsibilities, along with the accompanying costs, upon groups of fishermen, area by area.

Since fish will move from area to area, it is essential to ask how the obvious management problem would be dealt with under an area by area management scheme. The answer, presumably, is that the situation would be similar to neighbouring coastal states sharing transboundary fishery resources. Comparable cooperative, joint management programs would be required.

## 6. CONCLUSIONS

Canada's Pacific coast fisheries do not, at this time, have significant examples of community-based fisheries management programs, or examples of fishermen-based management programs in general. The experience, however, which the management authorities have had with centralized resource management programs is causing them to experiment with new management approaches which could, in due course, lead to the devolution of resource management rights and responsibilities from government to the fishermen.

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## **MARINE RESOURCE MANAGEMENT IN KIRIBATI: A GREAT CONCERN FOR THE NATION, FISHERMEN AND THE UNEMPLOYED**

by

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### **1. BACKGROUND**

The Republic of Kiribati is made up of three island groups composed of 33 atolls-Gilbert Islands, Line Islands and Phoenix Islands (Figure 1). The total population was approximately 63 883 in 1985. It increased to 72 298 in 1990, a rate of 2.24% as compared to 2.1% between 1978 and 1985 (Census, 1990). The total landmass is approximately 800 km<sup>2</sup>. The islands are spread over a vast ocean area over 3 200 km<sup>2</sup> from east to west and 1 600 from north to south. With the exception of Banaba (Ocean Island), an island of dubious geological history of basically coral reef origin, which rises to a height of 81 m, the islands are all of low coral reef formation seldom rising more than 4 m above sea level. About 35% of the population lives on South Tarawa, capital of the Republic (Census, 1990).

The people of Kiribati are a mixture of Polynesian and Micronesian races but the latter predominate. Other ethnic groups make up about 3% of the total population. I-Kiribati (meaning nationals of Kiribati) are traditionally subsistence fisherfolk. Primitive fishing methods have been replaced with more efficient and sophisticated methods resulting in greater fish landings. An increase in human population and the influx of aid are among the factors contributing to a rapid decline and overexploitation of some of the marine resources.

### **2. TRADITIONAL RESOURCE MANAGEMENT**

Sea tenure has been the practice whereby a clan or village or family may own a portion of the lagoon or reef. Fishing within these areas was illegal but the Government has declared that anything below high tide mark belongs to the Government, and that implies open access. Traditional fishing rights are observed more strictly in rural areas than in Urban South Tarawa (capital of Kiribati). A rapid growth in human population has increased the demand for food. Finfish and shellfish are the main source of protein.

### **3. INTERNATIONAL RESOURCE MANAGEMENT**

Kiribati sees its marine resources as important commodities. The EEZ has been a burning issue especially in the tuna industry. The US fishermen in particular believe that tuna is a migratory species and therefore it should be publicly accessible, pursued in any country's territorial waters.



A treaty was made between the world tuna fleets and the Pacific Island countries whereby a fee has to be paid in order to legalize fishing in territorial waters. Catches have to be declared to the host country (Table 1). There are a few cases where tuna boats have been confiscated for illegal fishing either because of expiry of the license or simply for poaching.

The Fisheries Division of the Ministry of Environment and Natural Resources Development is responsible to the Government of Kiribati on this issue. Fisheries officers are called in from periodically to check if the number of fishing boats in a fleet corresponds to the licensing fee paid.

The countries which have been fishing in Kiribati EEZ are Taiwan, Korea, Japan and USA. The Taiwanese have been banned and the Korean tuna fleets have not renewed their licence which expired towards the end of last year. The tuna fleets are mainly engaged in purse-seining, pole and longlining.

#### 4. REGULATING DEVICE

Tuna fishing in Kiribati EEZ is controlled by domestic carriers, Australian and New Zealand Air Force patrols and by local cargo boats. These are issued with a list of names of boats of each licensed fleet, and any irregularities or suspicion is reported to the Fisheries Headquarters via the Marine Guard Division.

Inshore fisheries are generally not regulated but in some cases certain fishing grounds and areas are private properties. These are looked after by either the whole village, a family, a clan or the head of a family. The island council recognizes these rights and any breach is punishable. However, the Government may ignore these rights in the interest of the fishing community.

#### 5. FISHING METHODS - MODERN VERSUS TRADITIONAL

There is a great discrepancy in catch size between modern and traditional fishing methods; the former can treble and even quadruple the latter. One classic example is a traditional fishing method used in catching flying fish. Local boats or canoes have been and are still used, but the number of motor-powered canoes and boats is increasing dramatically. More and more fish is being landed for small commercial markets. Some of these have been overexploited, e.g., *Anadra maculosa* (a shellfish).

#### 6. REGULATION AND MANAGEMENT OF EXISTING INSHORE MARINE RESOURCE

##### (a) Lobster

This by-law is effectively observed by people living on Christmas Island in the Line Group. The by-law dictates the size and condition of lobster that can be harvested. Berried individuals are strictly protected and any fisherman caught violating this law is heavily fined.

(b) Gold Spot Herring (*Herklotischthys quadrimaculatus*)

This by-law was formulated five years ago by North Tarawa Island Council in an effort to protect the resource from the tuna fishing vessels. The people, particularly fishermen, claimed that the seining method used by the tuna boats depletes the resource for the tuna fishing vessels, and that the seining method used by the tuna boats depletes the resource dramatically as compared to cast nets which only take a minute portion of the school. This by-law has been scrapped by the Government of Kiribati in an effort to help the tuna boats obtain live bait from closeby rather than catching it on other distant islands or buying the more expensive milkfish.

7. TARAWA LAGOON PROJECT

This project is aimed at studying finfish and shellfish biology and ecology in an effort to provide scientific information on which to base conservation and management strategies on the coastal and inshore marine living resources in Tarawa where the problem of overexploitation is a threat to the marine resources. The main target species are bone fish, Lethrinidae, silver biddy, bivalves (*Andara* in particular), *Strombus* (cone shell), goatfish and mullet.

8. CONSTRAINTS

(a) One of the main problems regarding management is the lack of understanding by the fishermen and public at large. No management strategy will be effective unless the people of Kiribati understand the benefits involved. It will take much time before any regulation can be effective. Intensive public campaigns and education at a village level will be the most essential tools.

(b) A rapid increase in human population sets a potential threat to the marine resources unless management laws are enforced and observed. All available marine food sources are constantly tapped to feed the usually large families. Any restriction imposed may starve these families for months. Perhaps the best solution is to make restrictions on any one resource at a time so that by the time this resource is fully managed and enhanced it can be harvested while and other resources are restored.

(c) Development aid in kind or in monetary terms can be destructive to the marine resource. Reef blasting and causeway construction have had a disastrous impact on both the environment and the food source-fish. Coastal erasions and ciguatera fish poisoning are some of the side effects. Australia, New Zealand and Japan have been providing aid in such development.

(d) The importation and introduction of modern gear have contributed to the increase in marine resource landings. Outboard motors, gillnets, torches, etc., are slowly replacing traditional fishing gears which are often primitive and much less efficient.

9. FISHERMEN AS A REGULATING DEVICE

Both subsistence and small-scale fishermen can make a strong and efficient contribution to fishing management and regulation. A well-planned approach needs to be worked out. Once these people understand the importance of their role in fishery management and the importance of management itself, the by-laws will be worth formulating.

10. EXCERPT FROM THE SPEECH OF THE PRESIDENT OF KIRIBATI AT THE OPENING OF THE FIRST MEETING AT THE PARLIAMENT HOUSE IN 1992

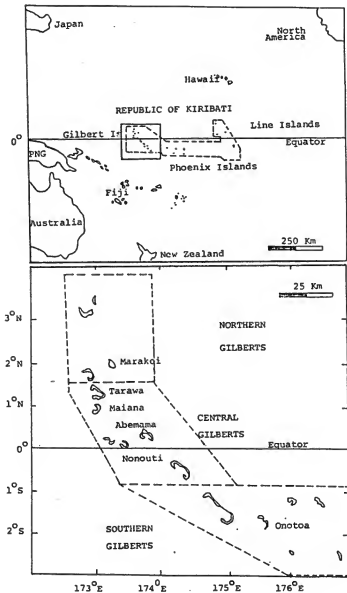
"To ensure, however, that we get the maximum benefit, the exploitation of our marine resources must be done in such a way it is on a sustainable basis. This calls for a better policing of our EEZ, and an introduction of proper conservation measures. We intend, therefore, to seek other ways of increasing the aerial surveillance currently provided by New Zealand and Australia, and to consider other means of making it more effective. In areas where certain resources are being threatened by over-exploitation, we will consider introducing appropriate conservation measures to ensure that our people will continue to benefit from those resources".

Table 1

Tuna Catches (mt) from 1989 to 1991  
(Fisheries Report, 1991)

<u>Nation</u>	<u>Fishing Method</u>	<u>Total Catch</u>	<u>Year</u>
Japan	Long liners	1 643.2	1989
Japan	Pole and liners	21 234.4	1989
Korea	Long liners	6 071.9	1989
USA	Purse seiners	2 739.0	1989
	Overall	<u>30 045.3</u>	
Japan	Long liners	349.4	1990
Japan	Pole and liners	1 069.0	1990
Korea	Long liners	6 252.8	1990
Taiwan	Long liners	130.7	1990
USA	Purse seiners	73 701.5	1990
	Overall	<u>81 154.0</u>	
Japan	Long liners	397.6	1991
Japan	Pole and liners	3 549.4	1991
Korea	Long liners	3 953.8	1991
USA	Purse seiners	26 982.4	1991
	Overall	<u>34 485.6</u>	

Figure 1 - Map of the Central Pacific showing the position of the Republic of Kiribati with the Gilbert Islands inserted



## TRADITIONAL COMMUNITY-BASED FISHERIES MANAGEMENT PRACTICES IN INDONESIA

by

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### ABSTRACT

Indonesian fishermen have generally been practising modes of production which are environmentally-unfriendly. Little regard was given to the need in sustaining the stock and flow of such resources. This is in spite of the existence of rules, regulations and measures governing the exploitation and development of the country's fisheries resources.

As far as available records show, many of these rules have a common denominator: they are imposed from the top and in some cases thus lack grassroots or community participation. The people which these rules are supposed to benefit were seldom provided with adequate explanation or "preparation".

This is in contrast to traditional fisheries management "practices" and/or traditional fishing rights systems in which the community to be "governed" are explicitly compelled or made to get involved - directly. Non-compliance under such systems results in severe penalization. Pressures are brought to bear on the community for any infringement or violation, especially on the individual violator. The community's sense of belonging and participation is not only total but penally-binding. The community accepted such strict imposition on their production and consumption behaviour. They see certain benefits accruing to them if they comply and punished if they do not. Here, the costs arising from penalization or punishment of non-compliance outweighed the returns from benefits which can accrue, especially arising from superstitions.

On the other hand, modern-day fisheries management schemes, though legally-binding, lack this active community participation - sense of belonging. Problems of enforcement and policing, especially costs of monitoring, control and surveillance remain the biggest obstacle. Violations become widespread because they do not see any benefits accruing to them for compliance. More importantly, the returns of non-compliance are high and the costs of non-compliance are worth the risks. Being less superstitious, having been exposed to science, that is education, the fear of the unknown or invisible punishment has been overcome. Also, there is a tendency that the spirit of the community good is slowly lost over time as fishing is increasingly commercialised and the community becomes more and more individualistic.

Five cases of traditional community-based fisheries management systems in Aceh in Western Indonesia, West and Central Kalimantan in Central Indonesia and Maluku in Eastern Indonesia are presented with a view to adapt them to modern fisheries management in the country.

## 1. INTRODUCTION

### 1.1 Background

With a few notable exceptions as recorded in the grey literature or still to be documented in certain cases, Indonesian fishermen, as elsewhere have been practising modes of fishing which are not generally sustainable. They are, however, not to be completely blamed nor faulted for engaging in such unsustainable fishing. It is in the nature and character of the natural resources they exploit which attracts more than the required capital and labour to take the available harvest. Fisheries resources are governed by common property, open access and free-entry regime.

The economy theory of common property natural resources explains why an uncontrolled fishery tends to attract excessive amounts of capital and labour and why it may be fished beyond the point of Maximum Sustainable Yield (MSY) (FAO, 1980). MSY is a biologically determined measure depending on fish recruitment and mortality rates.

Also, mankind has generally been relatively uncaring, employing unsustainable modes of production and consumption until recently. The former includes hunting and gathering (e.g. capture fisheries) and cultivating (e.g. culture fisheries) practices. The latter from conspicuous consumption. Witness the recent alarm on natural resource depletion, habitat destruction, environmental degradation and the global call to combat such life-threatening ills.

For far too long mankind has only taken but giving little, if any, in return to the natural resource system/environment upon which it has come to rely quite heavily for its well-being and continued survival. The need for natural resource management and conservation, and protection of the environment was recognized long ago but its practical field application was wrought with problems.

Many of the problems are related to weaknesses in implementation, mainly arising from poor enforcement or lack of enforcement of measures designed to develop and manage the resources and resource system. In fact, there is no lack of innovative and imaginative resource management and conservation measures in terms of rules, regulations and laws governing the exploitation, use, development and management of natural resources.

This is even more so for a natural resource system whose property rights are not well defined as in fisheries. It is made even more complex because fisheries exploitation is generally governed by open access or free entry defined by common property rights regime. A good case in point is the natural fisheries found in Indonesia and many other developing countries.

Unsustainable production and consumption arise not from a lack of awareness but from wanton human greed driven largely by short-run planning horizon and profit motive, including conspicuous consumption or materialistic lifestyle. The "common" wealth created or the stock and flow of the capital formed from the natural resources by different industries is also frequently not adequately ploughed back into the natural resource systems.

Certain segment(s) of the country's population, in particular the well-to-do members of the community (i.e. owners of capital or those who have access to capital) have little or no regard for the welfare of the rest of the community who have less or have to make do with

less. Very often, a lack of discipline rather than awareness also governs the productive and consumptive behaviour, attitudes and patterns of many producers and consumers.

This is not to deny that there also exist unsustainable modes of production which stem from ignorance and lack of foresight, notably among the poorest segment(s) of the population. Having to eke out a subsistence existence, living from hand to mouth, these poor and limited resource (including capital) members of the community are found to engage in natural resource-impairing and environmentally-damaging modes of production. Frequently, they do so not due to ignorance or lack of discipline but from the daily pressures of survival - surviving from day-to-day.

Here, a distinction has to be drawn between the fishermen and owners of fishing boats and capital who employ these fishermen. It is true that the visible hands which fish are those of the fishermen. The fishermen are thus the ones responsible for such unsustainable modes of production. They do this not because they want to or unknowingly but because they are seldom rewarded according to their productivity. In general, they are not given a fair return for their labour and effort and the risks they face at sea.

The owners of capital, of the fishing boats, the so-called invisible hands behind the scene reap a disproportionately bigger share of the total sales proceeds. This means that they get more than a fair return on their capital, entrepreneurship/management and the risks they shoulder as owners of capital. Plus, the resource rent (from common property fisheries), if any, also accrues disproportionately to them. This can be seen by the following observation:

"For every one fisherman who is able to own a motor vehicle earned from fishing, boat owner who owns a motor sedan and other comforts of life."

## 1.2 Traditional Share System

Fishermen in Indonesia as elsewhere are paid according to a traditional share system which has not been thoroughly examined. It has been in use for a long time without any meaningful modifications and improvements which benefit fishermen. For Indonesia, the share system was last examined and modified in the 1970s but its adoption remains problematic. Improvements have been slow and not visible. Fishermen, especially small-scale fishermen and fishing crew (labour) remain poor, with average per capita income of less than Rp 500 000/year.

This share system rewards fishermen according to the volume of catch, ex-vessel price of the catch and fishing (operational) costs. Because of perpetual chronic indebtedness to the fishing boat/capital owners, the fishermen have little or no say in fish price determination; they accept whatever prices they are given or told. They are abused or exploited because they are also generally illiterate.

Given such a socio-cultural-demographic-economic situation, the share system prevailing is such that the fishermen are rarely paid a fair return for their labour.

Thus squeezed, in order to keep ahead or from slipping back in terms of take-home income under conditions of reported cost-price squeeze in an already inequitable share system, the fishermen have no other alternative but to land more and more fish. The resulting fishing pressures exerted under conditions of declining fish stock further aggravate



fisheries productivity. To land more and more fish means that they will resort to whatever means they know to increase their catch. They thus end up using more and more indiscriminate fishing methods/gear to obtain a bigger catch. Plus, they are also constantly being supplied with fishing gear which are very efficient and resource-impairing such as smaller and smaller mesh size and dynamites and poisons. Motorization of fishing boats also contributes to this efficiency.

As fisheries resources slowly become depleted from mounting fishing pressures described above, the already-worsening situation grows even more fragile. It is time again that this socio-economic dichotomy between fishermen and fishing boat/capital owners be re-examined at this learned Expert Consultation.

### 1.3 History of Modern Fisheries Management in Indonesia

Indonesia is one of the very few countries among developing countries, if not the only country, with the vision and boldness to innovate in fisheries management and conservation measures. Every type of laws, rules and regulations limiting fishing effort governing the exploitation of fisheries resources has been proposed, examined and adopted with varying degrees of success. From mesh size regulation to closed areas and seasons to total ban of certain boats and gear such as the trawl ban of 1980.

Modern fisheries management measures such as closed or restricted areas, fishing zones and closed seasons, mesh size restriction and catch quotas and trawl ban were not effective because the policy and institution given the mandate to implement and enforce the rules, regulations and laws either do not have the necessary manpower, equipment and competence or the will and discipline to implement and enforce them. Frequently, it is powerless to act because its power may be undermined by the very authority which gives the institution the mandate and terms of reference to implement the law. The latter is usually the result of weakness in upholding the law. Although violations are routinely reported, violators are not brought to book.

Does this imply that the penaeid shrimp resources are now overfished? Part of this shrimp catch (11%) is from the eastern seaboard where trawling with by-catch excluding device (BED) is allowed in the Arafura Sea. This "overfished" condition has arisen in spite of the trawl ban in the western seaboard since 1980. It shows that the ban has not been effective as enforcement remains weak.

It has been 12 years since shrimp trawling was banned. It does not appear that the penaeid shrimp stock has or will recover. As such, the benefits many small-scale fishermen expected it to arise from the "recovering" shrimp stock did not materialize in any significant manner. Trawl ban violations continue to be reported or not unheard of. As powerful as the trawl ban was when it first came into effect, its impact has been relatively restricted, not to mention not benefiting the small-scale fishermen who were the target beneficiaries in the first place.

Another glaring shortcoming affecting fisheries management in the country concerns fishing boat licensing. As fundamental as government licensing to supervise, control and manage the fishermen and fisheries is, domestic fishermen are not required to pay any licence fee for the right to fish (except for industrial-scale fisheries like long-line fishing). This most basic government responsibility has not been used to monitor and control fishing

effort. It is suggested that the government makes use of the issuance and renewal of fishing licences to complement existing fisheries management. Fishing boat licensing is a basic management tool which the government has overlooked in the closer supervision of fishermen to effect changes in their production behaviour.

Modern fisheries management measures in the country are also said to be reactive, responding to problems which arose such as the case when trawling encroached on the fishing grounds of the small-scale fishermen or conflicted with other fishing gear such as gillnets, back in the 1970s. The government reacted by declaring and delimiting fishing zones by gear types. Monitoring and surveillance for compliance was facilitated by colour, which was prominent and number displayed on the boats. Even so, the scheme failed to check such conflicts and was left to run its course.

As in all the other cases, fishermen cooperation and sense of participation were not actively sought or developed. Since enforcement takes money and long-term commitment to demonstrate to fishermen the benefits which can accrue, its enforcement was weak and at best partial. Given such a situation, it is not surprising that present-day fisheries management has not been completely successful.

To sum up, there is thus no lack of fisheries management measures, including enabling laws, rules and regulations to manage the country's fisheries. They serve not only to develop, manage and protect the fisheries resources but also to benefit the fishermen, notably small-scale fishermen through regulating fishing effort. In fact, many of these rules or regulations or laws or even management measures are quite well-spelled out, elaborate and specific almost to a fault. The main drawback as cited above lies in their implementation and enforcement as well as a lack of community participation and involvement.

In other words, modern-day fisheries management schemes, though legally binding, lack active community participation - sense of belonging. Problems of enforcement and policing, especially costs of monitoring, control and surveillance, remain the biggest obstacle. Violations become widespread because fishermen do not see any benefits accruing to them for compliance. More importantly, the returns of non-compliance are high and the costs of non-compliance are worth the risks. Being less superstitious, having been exposed to science, that is education, the fear of the unknown or invisible punishment has been overcome. Also, the spirit of the community good may slowly be lost over time as fishing is increasingly commercialized and the community becomes more and more materialistic and individualistic.

This is in contrast to traditional fisheries management "practices" and/or traditional fishing rights systems in which the communities to be "governed" are explicitly compelled or made to get involved - directly. No-compliance under such systems results in severe penalization. Pressures are brought to bear on the community for any infringement or violation, especially on the individual violator. The community's sense of belonging and participation is not only total but penally-binding. The community accepted such strict imposition on their production and consumption behaviour. They see certain benefits accruing to them if they comply and punished if they do not.

Here, the costs arising from penalization or punishment of non-compliance are high, outweighing the returns and risks from non-compliance. Their inherent superstitious nature and belief in the supernatural also effectively check their behaviour to abide by the law.

Besides, the benefits from compliance are regarded as worthwhile and the costs of compliance a small cost.

#### 1.4 Purpose of Study

The purpose of this study is therefore to document and examine the different systems of traditional community-based fisheries management practices and traditional fishing rights systems found in Indonesia with a view to encourage its revival and adoption in Indonesian fisheries in complementing and supplementing existing fisheries management schemes.

A brief description of the features and characteristics of the existing institutions, formal and informal, under which the fisheries sector operates will also be provided. In this respect, the legal and institutional framework governing fisheries exploitation will be examined.

### 2. TRADITIONAL FISHING RIGHTS SYSTEMS

#### 2.1 Overview

There are excellent cases and experiences of community-evolved and community-based fishing practices which recognized the need for orderly exploitation and development of the resource base and resource management. They are by and large localized practices and experiences found in different geographical pockets throughout the country such as in Aceh in Western Indonesia, West and Central Kalimantan in Central Indonesia and Maluku and Irian Jaya in Eastern Indonesia. These traditional systems are mainly anchored on local customary laws and usually centred around tribal chieftains or heads of ethnic grouping known as *kepala suku*.

Until recently, these so-called traditional community-based fisheries management practices in Indonesia are not widely known, localized as they are to the areas where they are observed. They were no longer actively practised until recently when interests in their possible application in today's fisheries management began. They can be effectively applied to complement or supplement modern fisheries management schemes found in the country today.

The basic fundamental concept of Indonesia's traditional fishing rights and community-based fisheries management practices is founded on "restriction". In the local vernacular of the areas where such systems had evolved, these are referred to as "*larangan*" or "*sasi*". These "restrictions" are closely parallel to the modern closed area or closed season concept of fisheries management. There is nothing new or novel to the systems practised in those olden days except that the community is directly and actively enjoined by the tribal chieftains or *kepala suku* to observe the imposition of the restrictions or face the dire consequences.

Because the community or society is relatively small and closely-knitted, governed as it were by steeped traditions and customs, it is relatively easy for the entire community to monitor any violations of the restrictions. More fundamentally, the community is run by a "strongman" chieftain, and punishment was not only severe but meted out publicly. Violators were sometimes socially ostracised from the community and community activities, including public parade of violators.

## 2.2 Traditions of Customary Laws

Land rights and land tenure system in Indonesia are quite well developed and have been quite clearly spelled out in the law of the land. These had originally derived from customary land laws developed by the people and community where they are operational or can be invoked by the community through its leaders and elders. This is not the case with water rights and tenure system for water bodies. Part of the reason for this gap in the law of the land for water use rights stems from the early orientation and emphasis on land development for settlement, agriculture and mining. After all, humankind is a more land-based creature.

Even so, in certain geographical pockets spread throughout the Indonesian archipelago can be found well-defined cultural traditions and customary laws governing the use of water resources such as marine and inland fisheries and other aquatic resources. These community-wide resource management traditions were "invented" or evolved by the community itself. There was no apparent outside influence. Community elders and leaders formulated these practices based on years of keen observations and experiences. They are passed from one generation to another, from the *kepala suku* or tribal chieftain to his son and so on. It may have been influenced by local land-based customary laws.

Because these traditional resource management systems work for them and they directly or indirectly derive tangible benefits from compliance, the people and community have over time developed a strong sense of entitlement to the fish and aquatic resources they are managing. *Kepala suku* or their children and fisheries officials interviewed, report that the community will enforce their rights or entitlement to the fish in their community waters to the extent that they will fight to keep intruders (non-community members) from harvesting their fish. They also mete out penalties for violations or non-compliance.

Although these traditional resource management practices appear to take on the form of a legal-institutional structure within the community where they are invoked or operational, they have no legal basis outside its community. In other words, they cannot be applied outside their area of "jurisdiction" or influence (authority).

Following below is a brief introduction and description of these traditional systems for managing marine and inland open water fisheries and other aquatic resources found in Indonesia.

### 2.2.1 Sasi System

No information is available on the origin of the *sasi system* as practised in Maluku and Irian Jaya. Under the *sasi system*, the *kepala suku* sometimes also known as *kepala adat* (customs and cultural head), is the owner or *uan* of the fish and aquatic resources in his community waters. From this, the community waters under his jurisdiction or control become his *petuanan* or owned-water area. His claim over such water area is respected and honoured by other communities.

The practice of *sasi system* today can be broken into the following four main categories:

- (a) location-based and -oriented restriction
  - (i) closed and open area

- (ii) habitat and sanctuary
- (iii) combined area and season (see below)
- (b) time-based and -oriented restriction
  - (i) schedule for closed and open season
  - (ii) breeding season
  - (iii) combined season and area (see above)
- (c) technology or method-based and -oriented restriction
  - (i) gear type
  - (ii) fishing method
- (d) species-based and -oriented restriction
  - (i) species
  - (ii) age and size (immature and gravid female)
  - (iii) schooling vs non-schooling species

To mark the boundaries of the *sasi* area, simple wooden structures like a pole crowned with a coconut and palm leaves are staked into the sea, physically delimiting the *sasi* boundaries. Rituals, invoking sacred spirits to guard the off-limit area are performed to strengthen its mystic character. Such rituals, performed over time, serve not only to strengthen the community's belief in it but to institutionalize the system. Prominent rocks and promontories as well as unique seascape are also used as physical boundary markers of *sasi* area.

Zerner (1990) also reports the use of shallow sea as the *sasi* area. This shallow sea is the area where the sea bottom is visible. This is in contrast to deep sea where the sea floor is not visible. Locally, the shallow sea is known as *air putih* or white water and the deep sea is *air hitam* or black water.

Those caught violating *sasi* rules are brought before the community, be they members of the community or non-members or outsiders. For outsiders, they are usually forewarned before they commit the violation. At any rate, those apprehended are either fined or publicly paraded or displayed to embarrass them or given corporal punishment as in flogging; other forms of penalty include, but are not necessarily, limited to the temporary/permanent confiscation of their boats and gear. In cases of permanent confiscation, the boats are sold. The type of sanctions meted out depends on the severity of the offence. According to Zerner (1990), those caught using nets or caught swimming or diving in a closed *sasi* area are fined Rp 25 000/person or about US\$ 12,50/person. Those arrested for taking trochus shell (*Trochus niloticus*) during the restricted period or from the restricted area are fined Rp 7 500 each (US\$ 3,50) for large shells and Rp 2 500 each (US\$ 1,25) for smaller ones.

Besides the above physical and financial punishments meted out, banishment or exile from the community, a socio-psycho-cultural form of punishment is still reportedly practised.

Today, the local government head at the village community level is not necessary to be the *kepala suku* or *kepala adat*. The position can be held by a person other than the tribal

chief or leader of the ethnic group. As will be shown below, recent developments in the implementation of the *sasi* system in certain parts of Maluku are threatening to breakdown the age-old customary law and tradition.

#### Recent Developments in the *Sasi* System

Either unintentionally or intentionally or even superseded by recent national laws and regulations since Independence, recent developments taking place in the Maluku *sasi* system have direct and indirect implications for the future adoption of the system on a wider scale in the country. Zerner (1990) reports the breakdown of the original *sasi* system due to the reallocation of the rights from the *kepala suku* to the local government head. In this case, the local government has recently taken over the control and decision-making of the old *sasi* system from the *kepala suku*.

Under the previous arrangement, the community is allowed to fish when the *sasi* is opened and keep the catch or income when the catch is sold. Under the new arrangement, the community is hired to harvest the catch. They are paid a wage and therefore not allowed to keep the catch or income. All income from the sale of the catch is kept by the local government treasury. In turn, this income is earmarked to be used to finance community infrastructure, community development or community improvement projects.

In the olden days and until recently, the *sasi* system is a community-based resource management scheme. It had worked for them because of community support, involvement and participation. Their sense of belonging and loyalty to the system was strong.

It is acknowledged by *sasi* community elders that the *sasi*'s hold on the community is said to be more binding the more remote the community is from modern influence. There, the *sasi* boundaries or demarcated segments of the coastal or inshore seas were strictly observed. Figure 1 shows the schematic structure of the *sasi* administration.

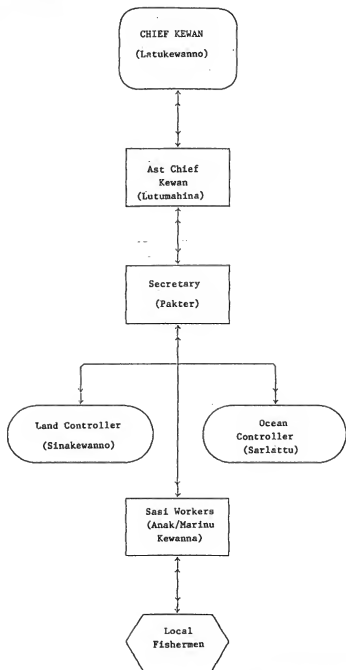
#### 2.2.2 *Panglima Laut* System

Like the rest of the country, the Province of Aceh in Sumatra is also rich in socio-cultural traditions and customary laws governing individual and societal or community behaviour affecting every day life from birth to death. The present socio-institutional-legal system affecting resource use and production in Aceh, among others, which has evolved over time from the old traditional socio-cultural system as practised today is quite elaborate.

One of these systems is called the traditional *Panglima Laut* System, literally the Sea Admiral or Commander System. The Sea Commander is the person who oversees and guides socio-cultural traditions, customs and practices affecting marine capture fisheries, including determining the location/area for fishing, landing of fish and docking/mooring of fishing boats as well as settling disputes arising from the share system.

In addition to the *Panglima Laut* System, there are also the following traditional systems still observed in the Province.

Figure 1 - Administrative Structure of Sasi



- (a) *Tuha Peur* It is a body which advises the *keuchikkepala desa* and *kepala kelurahan* or village/resort head on matters pertaining to customary laws, social customs and norms and societal/community traditions and practices.
- (b) *Imeum Meunasah* He is the person who guides societal/community activities on the practice of Islam religion.
- (c) *Kjruen Blang* He is the person who assists the village/resort head on matters pertaining to the regulations and use of irrigation waters for *padi* cultivation.
- (d) *Petua Seunebok* He is in-charge of guiding, determining and organizing the opening up of virgin land for *padi* and foodcrop production.
- (e) *Haria Peukan* He is the person who controls and manages the orderly function and cleanliness/sanitary conditions of the market as well as the collection of market tax and cess.
- (f) *Syahbanda* The *Syahbanda* or harbour master oversees and controls the traffic, moorage and navigation of marine and river transport boats in and out of the harbour.

As far as it can be determined, the *Panglima Laut System* is found only in Aceh on the Island of Sumatra. According to the Provincial Fisheries Service, its application is no longer widespread but still well coordinated (Maksoem, 1992, pers. comm.). Further, very little has been written or documented on the actual system. Knowledge of the system is passed from word of mouth from one generation to another.

Like many other traditions and customary practices, this system has also given way to modern influences and is no longer widely or actively observed. To encourage its revival and possible application in modern day fisheries management, the Provincial Fisheries Service recently organized and convened a *musyawarah* or dialogue/discussion on the subject from 23 to 25 January 1992. With the support of the fishing community and its elders/leaders in Aceh, the provincial government through the Provincial Fisheries Service has declared the adoption of the system throughout the province (Anon, 1992).

Figures 2 and 3 show the organizational and administrative structure and composition of the *panglima laut system*. According to the newly revived system, in each area or locality in the province where an active fishing community is based or where their fishing boats are docked, the *panglima laut system* will be revived or re-introduced and strengthened. Under the newly revitalized system, the activities of the fishing community will be guided by a *panglima laut*.

There are two main types of the *panglima laut system* which are presently enforced in Aceh.

- (a) *Panglima laut thok* or local area sea commander, and



Figure 2 - Organizational and Administrative Structure of the *Panglima Laut Lhok*

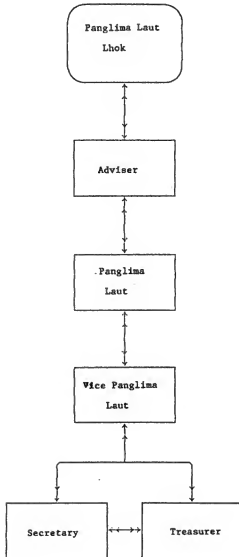


Figure 3 - Administrative Structure of the *Panglima Laut Kabupaten/Kolamadya*

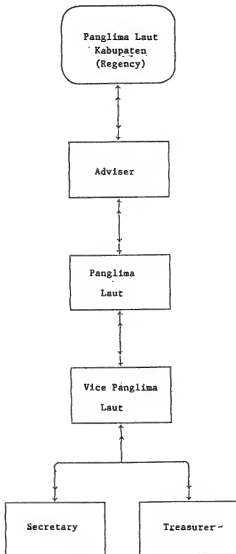
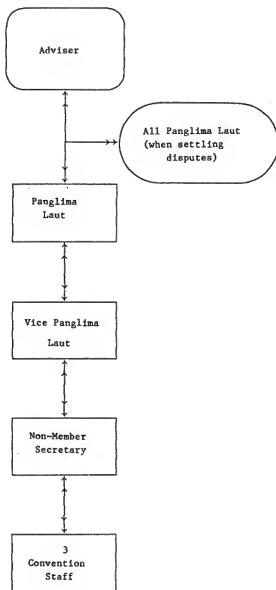


Figure 4 - Organizational Structure of the Convention of the Sea Customary Law



- (b) *Panglima laut kabupaten/koramadya* or regency/provincial capital sea commander.

The functions and responsibilities of the *panglima laut* are:

- (a) Assist the government in the further development, refinement and preservation of the local customary laws and traditions pertaining to the *panglima laut system*.
- (b) Control and maintain/uphold all sea customary laws and traditions.
- (c) Coordinate each and every fishing activity in the sea under his jurisdiction.
- (d) Settle and resolve all disputes and conflicts arising from fishing among members of the fishing community.
- (e) Administer and carry out all sea tradition ceremonies in his locality.
- (f) Ensure that mangrove vegetation and other flora and fauna of the mangroves along the coast are not cut down or destroyed or impaired as the fish will migrate offshore.
- (g) Act as the communication link between fishermen and government and among all the *panglima laut* in the province.

Further, this grassroots *panglima laut system* is assisted by a higher-level body convened by the different *panglima laut systems*. Figure 4 shows the organizational structure of this Convention of the Sea Customary Law, locally called the *Lembaga Persidangan Hukum Adat Laut* at the *Lhok* or *Kabupaten* and *Koramadya* level.

The *panglima laut* will be selected from among the fishermen based on the following conditions.

- (a) A minimum of 5 candidates for selection.
  - (i) Candidates must be faithful to their religion.
  - (ii) Candidates must possess spiritual/magical powers as found in a *pawang* or traditional medicineman with such powers as well as experienced and knowledgeable in matters pertaining to the sea.
  - (iii) Candidates must be able to read and write (completed primary education) and of a sound mind.
  - (iv) Candidates must be a resident of the area/locality and must be a citizen of Indonesia.
  - (v) Candidates must be male, married and not more than 55 years old.
- (b) Selection of the *panglima laut* is based on discussion, consultation, deliberation and agreement.

- (c) Candidates must be selected by the *pawang* of the concerned area.
- (d) Selection forum is considered valid when attended by at least a quorum of two-thirds of all the *pawang* in the area and is witnessed by official(s) from the government like the Provincial Fisheries Service or resort administration at the *Lhok* level and the Head of the Provincial Fisheries Service and/or Head of the Regency at the *kabupaten/kotamadya* level who act(s) as the trustee.
- (e) Candidate with the highest number of votes becomes the *panglima laut*, the second highest becomes the vice-*panglima laut*, the third highest is the treasurer and the remaining two become the members of the *panglima laut* committee.
- (f) Selection is carried out at a minimum of once in three years or at each sea ritual offering.
- (g) In case of a tie, the final decision taken is based on discussion and consultation.

(NOTE: the above is a generalized system of selection for the sea commander. The only significant variation at the two levels lies in the condition that the candidate for the sea commander at the regency or provincial capital level has to be a sea commander at the *Lhok* level)

Provisions of the Sea Customary Law and Tradition  
(*Panglima Laut System*)

Rules Governing Fishing and Share System:

Fishermen fishing in the marine or coastal waters in the province are subjected to more or less the same set of rules governing fishing and share system under the traditional *panglima laut system*. These are now standardized to minimize possible confusion.

- (a) No permanent or semi-permanent fishing equipment/gear such as the *bagan* (variations include *bagan apung/palong/unyam*) or lift net with a hut or shelter built over it is allowed to be set up or constructed in the sea lanes used for navigation.
- (b) Sites used by fishermen to tie up and moor their boats must have government permit.
- (c) Coastal areas used by fishermen to repair their boats and dry and/or mend their fishing gear or nets must be upheld or maintained.
- (d) Share system adopted at the provincial or local level must be the one in use in each local water.

Sea Taboos:

The following days are observed as taboo days for fishermen to go out to sea and their accompanying penalties.

- (a) *Kenduri Adat Laut* or Sea Tradition Ritual Offering/Feast: this ritual is held at least once in three years and lasts for three days, depending on area fishermen interest, agreement and willingness. During these three days from sunrise on the first day of the *kenduri* to sunset on the third day of the feast, no fisherman is allowed to go out to sea to fish.
- (b) Fridays: No fisherman is allowed to go fishing on any Friday from sunset on Thursday to sunset of Friday, i.e. one whole day.
- (c) *Hari Raya Aidil Fitri* or Islamic New Year Day: Fishermen cannot fish for two whole days during this taboo period, starting from sunset to sunset on the second day.
- (d) *Hari Raya Aidil Adha* or Islamic Holy Pilgrimage Day: This taboo lasts for three whole days from sunset to sunset on the third day of the holy celebration.
- (e) Independence Day: No fisherman is allowed to fish from sunset on the 16 August to sunset on 17 August of any year.

Fishermen violating these taboos are punishable according to the following sanctions:

- (a) The whole catch is confiscated.
- (b) Fisherman(e)n are barred from fishing for a minimum of 3 days to a maximum of 7 days for each violation. As a corollary, the fishing gear and equipment of the offending party are held in custody for a minimum of 3 days and a maximum of 7 days.
- (c) Or fines of minimum of Rp 3 000 up to a maximum of Rp 7 000 per violation are imposed on violators.
- (d) Second time offenders within 6 months of the first offence are fined a minimum of Rp 6 000 up to a maximum of Rp 14 000 or prohibited from fishing a minimum of 6 days up to a maximum of 14 days.
- (e) Third time offenders within the first 6 months of the first offence are fined a minimum of Rp 9 000 up to a maximum of Rp 21 000 or barred from fishing for a minimum of 9 days to a maximum of 21 days.
- (f) Fishermen caught the fourth time within 6 months of the first offence are strictly forbidden from fishing in the waters of the concerned regency for one year and their fishing permits withdrawn.

Violations and disputes are settled at the local level in the respective areas. Here, it should be pointed out that the provisions and stipulations of these traditional sea customary laws should not conflict with existing or present-day government and Islamic laws and regulations; in cases of inconsistency or conflicting provisions, the latter takes precedence.

Social Customs and Norms:

Under the social customs and norms as practised by the fishing community, the following standards of social behaviour are observed.

- (a) When a fishing boat or boat engine or equipment breaks down at sea or fishing gear is damaged, a distressed signal such as raising the flag will be given as an SOS request for assistance. Boats seeing such signals are to respond to render help.
- (b) Whenever a fishing boat is reported to be lost or sunk or fishermen drowned at sea, all available fishing boats have to mount a search and rescue operation for a minimum of one day. The boat finding the body or bodies of the victim(s) has the responsibility to bring the victim(s) to shore.

#### Environmental and Resource Conservation and Protection Customs:

In addition, the sea customary laws and traditions also spelled out the following measures to protect the resource system they rely on for their livelihood:

- (a) Indiscriminate fishing employing explosives or dynamites, poisons and other drugs and electric current or taking of coral and other aquatic organisms or mining of sand which destroys or impairs the living aquatic environment or habitat is prohibited.
- (b) Cutting, chopping or destruction of trees and other vegetation such as *nipah* and pandanus palm, sea almond and pine trees along the coastal areas is also prohibited.

#### Customs on Fiotsam:

According to this practice, any fisherman who finds part(s) of the body of a boat floating in the sea has to retrieve it and report the matter to the local *panglima laut* for his necessary further actions.

#### Financing *Panglima Laut* activities:

The following are the sources of revenues to finance the activities of the *panglima laut* system.

- (a) Revenues from membership fees.
- (b) Revenues from the sale of confiscated fish.
- (c) Revenues from charging 10% of overhead costs of convening a meeting to arbitrate/settle disputes.
- (d) Revenues from *uang meja* or table money, a Rp 5 000 fee payable to convene a hearing by the aggrieved party.
- (e) Revenues from 5% commission fee from the sale of a fishing boat or gear or equipment for each transaction.

In the olden days during the Dutch colonial rule, the *panglima laut* system was part of the government regulatory and legal structure. However, since the country's independence, notably when customary laws came under *Peraturan Daerah (Perda)* or local area regulations (No. 2 Tahun 1990), the *panglima laut* customary law system was excluded from official government system. It is now operative at the local level outside the government administrative structure.

### 2.2.3 *Lubuk Larangan System*

As the name implies, *lubuk larangan* is a closed or off-limit deeper portion of a river system with underwater caves/caverns (as in a deep water hole) which serve as a breeding/spawning ground, nursery and habitat for fish.

Under this system of fisheries management as practised in certain fishing communities in North Sumatra, the head of the village or head of the resort or regency where the *lubuk* is found is responsible in determining and declaring the closing and opening of the *lubuk* to fishing, in close consultation with experienced fishermen.

*Lubuk larangan* came about from the fishing community's concern on the widely-observed unsustainable fishing practices in the area. During certain periods of the year, especially during the spawning season and the period immediately following this, the *lubuk* is off-limit to fishermen. In other words, no person is allowed to fish or catch any fish from the closed *lubuk*. Any person violating the locally-imposed measure will be penalized. The penalty normally involves a fine and/or the fisherman caught will be barred from further fishing in the *lubuk*. The severity of the penalty imposed is dependent on the frequency of violation by the same party.

When the *lubuk* is declared open for fishing, every person from the community is allowed to fish in the *lubuk* for a fee. This fee is determined and agreed upon by community consensus. This is because the proceeds from the collection of the fishing fees are used for community improvement projects such as repair and maintenance and construction of roads, bridges, mosques, schools, community halls and other similar community infrastructures. The revenues collected are kept in the local treasury.

Interestingly, fishing is allowed just outside and beyond the boundaries or demarcated area of the *lubuk*. Thus, any fish, gravid female or under-sized fish is fair game and can be landed without any consequences. The Provincial Fisheries Service and its regency/resort level branches in North Sumatra are encouraging the wider adoption of the system.

### 2.2.4 *Malay and Dayak Traditional Fishing Systems in Borneo*

In Borneo or Kalimantan, especially in the provinces of West and Central Kalimantan, the native *Malay* and *Dayak* fishermen in the interior have evolved a system of fishing which prohibits the use of indiscriminate fishing methods as early as the 19th Century. As far as it can be ascertained, there was no outside influence in shaping their system of fishing. *Malay* and *Dayak* chiefs and elders with the advice of experienced and observant fishermen have gradually developed a system of fishing which is sensible to them.

For example, Saililah (undated) who lived among the *Dayak* beginning in 1926 reported that the use of tuba, a poisonous extract from a plant in the jungles, called rotenone to catch



fish had been discontinued when *Dayak* chiefs and elders observed that all fish is indiscriminately killed by the poison when the tuba extract is poured on the water surface. he reported different methods in the application of tuba.

So is the use of certain gear which are damaging to the fish stock, such as stationary fish traps made from wood and bamboo which do not allow young or juvenile fish to escape. The trap is linked to a filter positioned on the river bed in such a way that the fish swimming up and down the river or during its spawning migration have to pass.

### 3. DISCUSSION AND CONCLUSION

#### 3.1 Summary and Recommendations

Improved fisheries resource productivity, stability, sustainability and equitability can be assured through improved resource management systems made possible under the established traditions of the rules of the laws and the upholding or maintenance of private property rights. When private property rights to the fisheries can be granted or assigned to the fishermen, not only will the choice of fisheries management become clear but the fishermen themselves will simultaneously and strongly ensure that the management measures/controls are implemented to the last letter of the law.

There is now more and more evidence and agreement among fisheries workers that to reverse and break the poverty trap these fishermen are caught in, "it is increasingly necessary to develop and manage the fisheries by removing the conditions of common property rights of the fisheries". That is, to grant private property rights (emphasis on private) of the fisheries to the fishermen, among others.

Capital formation or wealth creation for productive purposes, including "need-consumption" is necessary to improve the quality of life of the people. The adage "Waste Not and Want Not" best summarizes the wisdom of productive, sustainable, stable and equitable mode of production and consumption.

To operationalize it, it is necessary to establish a legal framework for operationalizing these community-based fisheries management systems. This calls for the legislation of necessary rules, regulations and laws to ensure the development, management and exploitation of the fisheries.

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## **THE COMMUNITY-BASED FISHERY MANAGEMENT SYSTEM: ISSUES, PROBLEMS AND CONSTRAINTS**

by

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### **ABSTRACT**

In many Asian countries, the fisheries sector faces serious problems arising from over-exploitation. The socio-economic conditions of artisanal fishermen are deteriorating; conflicts occur between small-scale and industrial fisheries; excessive investment leads to economic waste; coastal ecosystems are under environmental stress and degradation. There is thus a search for new management concepts and approaches and particular attention has been given to the community-based fisheries management system which has been implemented with notable success in Japan. Community-based management helps to minimize administrative and enforcement costs, maximizes the use of local knowledge and expertise and encourages a higher degree of compliance and commitment by fishermen to the principles and practices of fisheries management and conservation. The paper reviews and analyzes the issues and problems which must be overcome in many developing countries before community-based systems can be successfully introduced. Among the prerequisites identified are the need for exclusive use rights to fishermen, the existence of strong, self-reliant fishermen's organizations, the presence or promotion of appropriate behavioural and attitudinal conditions and strong support from above. Other important conditions or actions include the relevant reform of national fisheries legislation, the creation of a strong administrative framework and the transfer of surveillance and enforcement responsibilities to the users of the resource. Attempts to promote the wider acceptance and introduction of community-based management must continue, not as a unique solution but within the context of a range of options for more efficient management of the fish resources.

### **1. INTRODUCTION**

The fisheries of most developing countries in the ASEAN region are typically characterized by over-exploitation of the inshore fisheries. For example, the almost barren Gulf of Thailand, and the generally overfished Java Sea, the Straits of Malacca and the Manila Bay bear testimony to the deplorable state of the fisheries in this region.

During the last two decades, excess fishing effort has not only threatened depletion of the inshore fish stocks in these waters but has also led to a host of related problems. These include persistent high incidence of poverty and deterioration in the socio-economic conditions of artisanal fishermen; intensified conflicts between artisanal and commercial fishermen for the exploitation of inshore resources; economic waste caused by excess investment in fishing operation; coastal population overcrowding; and environmental stress and degradation of the coastal ecosystems.

Given these disturbing circumstances, the case for managing and regulating the fisheries in most developing countries in the Asia-Pacific region requires no further justification and elaboration. Basically, the objectives of fishery management and conservation are optimal utilization of the fishery resources and prevention of their over-exploitation. Towards this end, a wide range of management measures have been used, including control over fishing efforts and fishing capacity, time and area closures, catch quotas, mesh regulations and gear restrictions. While these measures have been relatively effective for the fisheries of the developed countries, the same is not true for the fisheries in most developing countries.

Therefore, a search for new management concepts and approaches has become the main preoccupation of those concerned with fisheries management in developing countries. One of the management concepts which has received much attention recently is the community-based fishery management system. The essence of such a system is that fishermen, rather than the Government, should be responsible for management and regulation of the fisheries. It is generally believed that if fishermen were given management responsibilities, they would be more committed and responsive to management measures. There is no denying, however, that there are bound to be political, legal, institutional and socio-economic problems and issues in putting such management systems into practice.

The purpose of this paper is to identify and examine some of the issues, problems and constraints of a community-based fishery management system. It focuses mainly on problems and issues related to the feasibility and implementation of such fishermen-initiated management system given the political, legal, institutional and socio-economic constraints facing the artisanal fisheries in most developing countries. Examples will, however, be drawn primarily from Malaysian experience and case studies.

## **2. THE COMMUNITY-BASED FISHERIES MANAGEMENT CONCEPT**

Community-based management is used here in the broad sense of self management involving decentralizing the decision-making responsibilities and functions involved in managing the fisheries resources to the fishermen or fishermen's organizations. In a sense, such a system can be said to be the opposite extreme of centralized planning and management concepts whereby all the decision-making of powers and responsibilities lie with central agencies. The advantages of a community-based management system are many and include minimization of administrative and enforcement costs, maximum utilization of local knowledge and expertise, higher degree

of acceptability and compliance, and fostering a sense of self-regulation and self-enforcement among fishermen.

The central concern of community-based management systems is that fishermen or fishermen's organizations will initiate, formulate and implement regulatory measures, thus bringing about a stronger commitment to comply with these measures. This approach emphasizes fishermen's voluntary participation and cooperative action in managing and regulating the fisheries. Hence, the essence here is self-management by the users (i.e. fishermen) for their own benefit.

The merits of a community-based management can be summarized as follows:

- (1) A better understanding of local conditions and problems since local resources (knowledge, expertise, leadership, etc.) are utilized in the formulation of management strategies and measures.
- (2) The system instils a strong sense of management and conservation responsibilities and commitment among fishermen.
- (3) Since fishermen themselves are involved in the formulation and implementation of management measures, a higher degree of compliance can be expected.
- (4) Self-enforcement is easier and cheaper, thus minimizing administrative and enforcement costs. This is particularly important for countries in which human and financial resources are scarce.
- (5) Surveillance and enforcement are easier and manageable since the sea areas to be covered will be relatively small.
- (6) The system allows for a sufficient degree of flexibility and can be easily modified to suit changing conditions and circumstances.
- (7) It enables fishermen to participate in resources surveys or studies by using their own fishing vessels and gear in the pre-designated study sites. Results from surveys/studies involving fishermen's participation are more accurate and reliable. They can also be obtained within a short period of time. Consequently, the state of fisheries resources in a given area can be made known to the local fishing communities more accurately and within a relatively shorter period.

This management system generated great interest in Japan in the 1980s, where it is often referred to as "the new fisheries management movement" (Hirasawa, 1991). Such a movement, as pointed out by Hirasawa, came about as a result of depleted inshore fisheries resources, intensifies competition for use of fishing grounds among coastal fishermen, the lack of appropriate management measures and the changing fishing scenario as a result of the 200 mile EEZ era in the 1970s which necessitated drastic changes in fisheries policies in Japan. Basically, the new fisheries management

movement involves fishermen and fishermen's cooperatives self management of use of fishing grounds or self-enforcement. One such fishermen-initiated management measure which had proved to be successful is the case of employing large mesh-size nets by small trawl and gillnet fishermen in Fukushima Prefecture. Hirasawa's studies revealed that an advantage of a fishermen-managed mesh-size regulation is higher compliance and hence a decline in regulation violations, less costly enforcement, wide applicability, the easiness to implement the regulation even without knowing the exact status of the stock concerned and higher returns to the fishermen.

The Japanese experience clearly demonstrates that fishermen are capable of formulating and implementing their own management measures effectively given their in-depth knowledge and understanding of the local problems and needs as well as the availability of local resources and talents. Furthermore, fishermen-initiated regulatory measures, once implemented, enjoy the support and backing of the local fishing communities. Enforcement is made easier through social sanctions imposed from within the community rather than legal sanctions imposed from outside. However, one must recognize the fact that such sanctions are most effective in a country like Japan where social values, morals and customs are strictly observed and practiced.

Japan's successful experience with fishermen-initiated management systems is understandable given the presence of all the necessary pre-conditions. These include the traditional fishing rights system practiced for coastal fisheries, a strong and self-reliant fisheries organization, (e.g. fishermen's cooperative) committed to fisheries management, a homogeneous fishing community, a cooperative spirit and sense of belonging and bondage among fishermen and, more importantly, their strong sense of moral and cultural values and responsibilities towards fisheries conservation and management. Such conditions and pre-requisites may not exist in most countries in the Asia Pacific region.

### **3. ISSUES, PROBLEMS AND CONSTRAINTS**

Since community-based or fishermen-initiated management is an unfamiliar concept in this region, there are bound to be several issues and problems which need to be addressed and resolved first before the concept can become a reality. For convenience, these issues, problems and constraints can be organized around three major sub-topics viz. legal and institutional, socio-economics, and political and administrative. It should be noted, however, that a degree of overlapping between these sub-topics can be expected.

#### **3.1 Legal and Institutional Issues**

##### **(a) Existing Fisheries Legal Framework**

In Malaysia, like most developing countries in the region, fishery management and regulatory powers, responsibilities and functions, are embodied within the broad legal framework of "Fisheries Acts and Regulations" (see Table 1). This legislation provides full powers to the Minister of Agriculture, a Federal Cabinet Minister, to enact laws and regulations for the control and management of the marine and estuarine

fisheries. Enforcement of the Acts, however, lies primarily with the Department of Fisheries but with support and assistance from the Marine Police and the Royal Malaysian Navy. It should be noted that all three are federal or central agencies.

A community-based management system implies transferring the planning, intervention and control of fisheries management to fishermen or fisheries organization. Such moves would certainly entail drastic changes to the existing fisheries legal law to permit the transfer of power and control of fisheries management from the central agency to fishermen or fishermen's organization. This transfer is necessary since fishermen have no formal powers to compel cooperation and compliance by all those affected by the system. Such drastic changes to the existing fisheries legal system cannot be done without thorough planning. Even if the fisheries law could be amended to accommodate this change, it may not be feasible in the Malaysian context where complex political and socio-economic diversities cannot justify the transfer of legal and enforcement powers to individuals or non-government organizations. Hence, removing this legal obstacle alone is not sufficient to implement the fishermen-initiated management concept.

#### (b) Legitimate Powers of the Fishermen's Organization

Another legal issue arising from the community-based management concept is, should the management body (e.g. fishermen's cooperative) be given the legal power to enforce management measures. Since management responsibilities also involve arrests and prosecutions of the violators, the question here is who should be carrying out these functions - the fishermen's organization or other legal entities such as the Department of Fisheries? It should be noted that under existing management regimes, even though enforcement activities (surveillance, detection, boarding and arrest) are the responsibilities of the Department of Fisheries, prosecution and conviction lie with the Session Court. Closely related is the difficult question of what penalties should be imposed for non-compliance or violations of measures implemented under a community-based management system? Should violators be fined or should they be charged in court? These legal issues need to be thoroughly evaluated and resolved before the community-based management approach can be successfully implemented. Hence, the most essential condition for a community-based management system must be a new legal framework which gives legitimate powers to the local management body to carry out its management and enforcement functions legally.

#### (c) Property Rights and Fishermen's Organization

Another pre-requisite for a community-based management system is that fishermen's cooperatives or other similar organizations are granted fishing or property rights. Such a concept in fisheries management has been used for a long time in such countries as Papua New Guinea, Côte d'Ivoire, Brazil, Japan, Sri Lanka, etc. Property rights have a number of advantages, the most significant being self-regulation by fishermen who consider the fish stocks as their property.

On the other hand, property rights have some disadvantages. At the FAO Expert Consultation on the Regulation of Fishing Effort (Fishing Mortality) in Rome

in 1983, some concern over the distributional implications of the property rights system was expressed. The system can be viewed as "unfair and not egalitarian, since it favours those securing such rights whilst denying opportunities to those who cannot secure them". In other words, property rights do not give equal opportunities to all fishermen to earn a living from the fisheries, and that some individual fishermen or group of fishermen would feel that they had been discriminated against. Thus, situation becomes more complex in cases where the fishing communities are not homogeneous. Thus, even though the property rights approach has considerable promise, it is not easily implementable in some countries, Malaysia included. Consequently, unless property rights are granted to the decentralized unit itself, fishermen's cooperative or a group of fishermen, it is quite impossible to implement the community-based management approach successfully.

#### (d) Fishermen's Organization and Fisheries Management

Under the community-based management concept, the decentralized unit entrusted with the management function is the fishermen's organization. In Japan, for example, fisheries cooperatives play the core role as the coordinator and implementor of management measures initiated by fishermen. Fisheries cooperatives in Japan are granted fishing rights, thus making it easier for these cooperatives to act as managers of the fishery resources. Hence, one of the essential pre-requisites for the successful implementation of a community-based management system is powerful and established management body such as fishermen's cooperatives.

The Malaysian experience with fishermen's cooperatives is best analyzed by examining the two most important cooperative institutions currently existing. These are the Fishermen's Cooperatives (Syarikat Kerjasama Nelayan or SKN) and the Fishermen's Associations (Persatuan Nelayan or PN). One basic characteristic of fishermen's cooperatives in Malaysia, unlike that in Japan, is that they are mainly government-initiated and controlled. Malaysian fishermen's cooperatives, especially Fishermen's Associations, not only receive manpower and management support from the government but are also granted substantial funding to implement economic projects. These include fish marketing and trading, ice, diesel, fishing nets and equipment, fish transportation, fish and cockle culture and provision/sundries retailing. Until recently, fishermen's cooperatives were also used as a mechanism for channelling government inputs and assistance such as licences, subsidies, loans and credit to the fishermen's. This policy resulted in the rapid proliferation of fishermen's cooperatives throughout the country in the 1960s and 1970s. While fishermen joined the cooperatives so as to be eligible for loans, subsidies and licences, their beliefs and convictions in cooperative principles and ideologies remained questionable.

It is clear from the above discussion that fishermen's cooperatives in Malaysia are used mainly to promote fishermen's participation in the modernization and development of the fisheries sector. With financial assistance from the Government, fishermen's organizations such as the Persatuan Nelayan were able to engage themselves in small businesses related to fishing. The long-term goal of these cooperatives appear to be geared towards business expansion and commercialization. In addition to its business activities, the Persatuan Nelayan also acts as a channel for the participation of



local fishermen in community development, helps mobilize local resources, channels information about local conditions, problems and needs to the government and provides a wide range of economic and social services to their members. In contrast with Japan fishermen's cooperatives in Malaysia are not seriously concerned with the management of fishery resources. The concepts of fishermen's cooperatives as "holders of fishing rights" and "managers of fishing resources" are completely alien to the Malaysian fishermen. It will certainly take a long time before fishermen's organizations in Malaysia and their members become accustomed to, and to be more oriented towards, resource management.

(e) Capacities of the PN and SKN

Even if fishermen's organizations (PN and SKN) in Malaysia were granted property rights to enable them to be managers of fishery resources, they would have to become more economically viable. Malaysia's experience with fisheries cooperatives development in the past is generally regarded as a complete failure. The basic reasons for this failure include political interference, administrative incapacities in programme implementation, managerial incompetence, and lack of commitment and conviction among members. It also become very clear that local elites, because of their persistent economic and political dominance, benefitted more from the cooperatives than fishermen. The failure of the SKN can also be partly attached to the fact that once they were no longer used as a mechanism for channelling government loans, subsidies and licences, most cooperatives became inactive, weak and unviable.

As for the Fishermen's Association or Persatuan Nelayan, despite strong government support and assistance, the institution is besieged with numerous problems and shortcomings. While the PN had demonstrated impressive progress in terms of number and memberships (Table 3), their financial performance in the business activities they have engaged in, is far from satisfactory. Several reasons can be advanced to explain this poor performance. These include lack of confidence, interest and participation by members in the economic projects; strong and deeply-entrenched patron-client relationship between fishermen and middlemen which tend to undermine any economic activities initiated by the PN; lack of qualifications, competence and experience among the PN staff in business management and day-to-day administration; lack of interest and commitment among the Board of Directors and personal conflicts and infighting; lack of working capital to sustain on-going economic projects; stiff competition from the more established private entrepreneurs, particularly the middlemen; and the non-viability of certain projects due to weak planning and implementation.

It is apparent from the above that PN is not yet ready to take on the role as the vehicle for increasing fishermen's participation in commercial enterprises. However, the PN cannot be expected to change overnight from institution which has a heavily socio-economic bias to a purely commercial profit-oriented enterprise. In view of these weaknesses and limitations, it is unrealistic to expect the PN to play the role of fishery manager under present circumstances. There is a need therefore to strengthen the weak positions of PN and SKN and turn them into viable enterprises. Hence, for a

community-based management system to be successful, it must be preceded by the existence of an appropriate and strong institutional framework.

### 3.2 Socio-Economic Issues

#### (a) Equity Considerations

In Malaysia, equity considerations have been given a strong bias in fishery management policies and strategies. This emphasis, considered to be politically motivated, arises from the socio-economic inequities which exist between groups of fishermen, chiefly along racial lines. Such economic inequities are most distinct between Malay and Chinese fishermen. Studies have shown that while Chinese fishermen are relatively economically wealthy (in term of income, employment status and ownership), Malay fishermen have remained poor, backward and disadvantaged. Consequently, and in consonance with the New Economic Policy (NEP), the Malaysian government has a serious political commitment to improve the socio-economic status of the Malay fishermen. This, however, must not be done at the expense of the other fishing communities.

Since fishing rights are an important pre-requisite of a community-based fishery management system, a pertinent issue which needs to be addressed urgently is which fishermen's groups should be granted this right. Should the poor Malay fishermen be given a special privilege to the fishing right? If fishing right is granted, who should be the holder of this right - fishermen or cooperatives? Another related problem is that if fishing rights are given to fishermen organizations (e.g. the Persatuan Nelayan), can fishermen who are not members of PN continue fishing in the same water? It should be noted that not all fishermen are members of either PN or SKN. Decisions as to how to distribute fishing rights to various groups of fishermen are therefore very complicated and sensitive. Another concern is that the fishing right may be monopolized by influential local elites and those fishermen who have important positions in the local fishermen's organizations. There is also the difficult decision as to how to distribute fishing rights equitably according to regions, states and sub-areas. An equitable distribution of fishing right is not easily achievable given the vast differences in fishery resource availability and potentials between areas.

#### (b) Illegal Fishing Vessels

There is also the difficulty of identifying exactly who are the "rightful" or genuine fishermen. This problem stems from the prevalence of part-time fishermen and illegal fishing vessels. Owing to ineffective and weak enforcement, a fairly substantial number of vessels have been operating illegally and undisturbed. After some time, the government is forced into recognizing the *status quo* of these vessels, thus enabling them to coexist with licensed vessels. To eliminate them would be socially and politically difficult. Already there are strong political pressures to legalize them on humanitarian grounds.

(c) Displacement of Fishermen

A community-based fishery management system involving the granting of fishing right to certain groups of fishermen may also generate other distributional implications. Specifically, certain individual fishermen or fishermen's groups may be displaced as a result of the fishing right system. This particularly applies to part-time fishermen, those operating illegal fishing vessels and fishermen who are not members of either the PN or SKN. The problem is further aggravated by the fact that employment opportunities outside of fishing may not be readily available.

When such a problem occurs, the trade-offs between gains from the fishing right and self-management systems and the losses in social welfare should be carefully assessed. It is important that any management system involving the displacement of fishermen should provide some compensation to those displaced. Without such compensation, the implementation of a community-based management system may have serious undesirable socio-economic implications. It would not be surprising if, as a last resort, displaced fishermen continue to fish illegally in areas designated for fishermen holding the fishing right.

(d) Enforcement Costs to the Management Body

It has been suggested that, under the community-based management system, administrative and enforcement costs to the government would be minimized. However, this may be true only in a situation where management measures introduced by the community-based management body are readily acceptable by everybody. Under such circumstances, surveillance and enforcement responsibilities and costs are lessened. But in instances where the new measures are not easily implemented, stringent surveillance and enforcement have to be carried out. Under such circumstances, the management body would have to bear the enforcement costs incurred. Thus, it appears that a community-based management system would imply transferring enforcement costs from the government to the local management body such as fishermen's cooperatives. Since enforcement can be very costly, fishermen cooperatives may not be able to perform the enforcement functions assigned to them. Therefore, before assuming the role of fishery managers, fishermen's organizations must be financially viable in order to finance the administrative costs associated with management and enforcement.

(e) Fishermen's Behaviour, Attitude and Culture

The success or failure of any management system, to a large extent, will greatly depend on fishermen's behaviour and attitude. As noted earlier, Malaysian fishermen in general are not familiar with the self-management or self-regulation concept. A study by Yahaya and Yamamoto (1988) on fishermen's perceptions and attitudes towards fishery resources and their management revealed some interesting facts concerning fishermen's attitudinal, behavioral and cultural conditions. For example, when asked who the fishermen believed should own the resources, more than half of those interviewed said that the local fishing communities should be given exclusive rights over the resources. However, when asked who should be responsible for the management and enforcement of fishing laws and regulations, more than three-quarters

felt that the government, because of its legitimate powers, should be the resource manager and law enforcer.

The study indicated that Malaysian fishermen's attitudes, behaviour and cultures are not conducive to the introduction of community-based management systems. Although generally supporting the fishing right principle, the fishermen were not prepared to accept the role of guardian of the fishery resources nor as the enforcer of fishing laws and regulations. The fishermen have, therefore, to be educated and inculcated with the spirit and attitude of self-management and voluntarism. This approach necessitates the commitment and services of local fishing communities who should be public spirited, dedicated, managerially capable, foresighted and sensitive to management needs.

### 3.3 Political and Administrative Issues

#### (a) Centralization versus Decentralization

In Malaysia, centralization seems to be the norm that pervades the fisheries management structure. This arises from the fact that, on achieving independence, the existing centralized political and administrative institutions were left largely untouched and the government followed a policy of centralized planning, intervention and control of the fisheries sector.

An argument in support of centralized planning intervention and control of the fisheries sector is that markets work imperfectly and tend to reward a few at the expense of the masses. In the Malaysian fisheries context, the exploitative middlemen or "towkay" system is a manifestation of market imperfections in the fisheries sector. Thus, many believed that market imperfections justify continued central control and intervention in fisheries development and management.

There are also powerful political reasons for perpetuating central control and intervention. Centralization means that the government is able to control those factors, such as licences, subsidies, loans and fisheries regulations, that are considered important for maintaining political stability. This is exceptionally important in a country like Malaysia where the fishermen are segregated by region, ethnicity and by socio-economic inequities. Clearly, attempts to counter centralization, as propagated by a fisherman-initiated or community-based management system, may have political consequences.

Another factor inhibiting the successful implementation of decentralization of fisheries management to fishermen or fishermen's organizations is the centrist attitude and behaviour on the part of politicians and government bureaucrats from the central agencies. Since decentralization implies that their powers will be severely circumscribed and limited, it is not surprising that there is strong resistance and opposition by central planners and administrators to such a move. Moreover, central fisheries officials may be unwilling to give fishermen or fishermen's organizations discretion in carrying out management and enforcement functions. Such centrist bias inhibits fishermen's ability to execute management functions effectively and efficiently.

Another constraint upon decentralization of management functions is the frequent inadequacy of human, financial and physical resources of the decentralized units, in this case the fishermen's organizations. Shortages of these resources restrict the ability of fishermen's organizations to perform management and enforcement functions assigned to them. Experiences with decentralization of non-fisheries organizations in Malaysia have shown that financial, human and physical resource constraints have inhibited the successful implementation of the concept.

(b) Political Commitment and Administrative Support

One of the essential conditions for effective implementation of the community-based management system is strong political will and commitment and support for the new management process from the top leadership. The degree to which national as well as local political leaders are committed to fishermen-initiated management programmes, the willingness of the national bureaucracy to facilitate and support these measures and the capacity of fishermen's organizations at the local level, all strongly influence the success of the system. Moreover, in view of the strong influence, the cooperation of traditional local rulers (village chiefs, fishermen's leaders, religious leaders, etc.) is vital for a smooth implementation of any fishermen-initiated community-based management programme. Finally, commitment and support from national, state and local fisheries officials whose functions are affected by a decentralized community-based management system is also essential.

Political and administrative support for community-based management approach should therefore embrace the reforming of national fisheries legislation to provide legal management powers to fishermen or fishermen's organizations; revamping of national, state as well as local fisheries administrative structures and systems in order to bring about greater involvement of fishermen in the initiation, planning, implementing and evaluation of management programmes; building the organizational (i.e. administrative/managerial) and technical capacities of the fishermen's organizations to initiate appropriate management programmes as well as execute; and provision of financial and technical backstopping to the fishermen's organization at the initial period.

#### 4. SUMMARY AND CONCLUSIONS

Community-based management of fish resources which emphasizes self-management and self-regulation by fishermen is an unfamiliar concept in Malaysia. The concept has, however, been successfully implemented in the coastal or inshore fisheries of Japan. Among the many advantages of the community-based management system are minimization of administrative and enforcement costs; maximum utilization of local knowledge and resources; higher degree of acceptability and compliance by fishermen and stronger sense of commitment and responsibilities among fishermen towards resource management and conservation. It must be emphasized, however, that in Japan most, if not all, of the essential pre-requisites for the successful implementation of the system already existed. These include a traditional system giving exclusive use rights to fishermen or fishermen's organization; homogeneous fishing communities; the presence of viable and self-reliant fishermen's organizations to act as

the management body; appropriate attitudinal, behavioral and cultural conditions; and strong political commitment and support by national leaders.

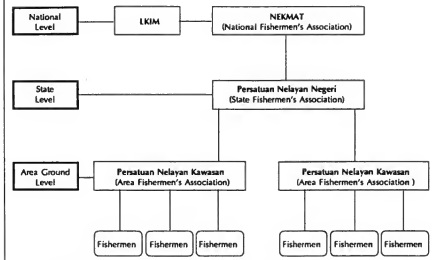
The successful application of the community-based management concept in Japan does not necessarily guarantee success if other countries were to emulate the system. As a relatively new concept, there are issues, problems and constraints which need to be resolved before the concept can be more widely translated into action.

Notwithstanding the many issues and constraints of the community-based management approach, attempts to apply this approach in the developing countries must not be abandoned. Experiences in Japan clearly demonstrate that much can be achieved by the fishermen-initiated self-management concept. The approach must be viewed, however, not as a general solution to all of the problems of ineffective fisheries management, but rather as one of a range of potential management strategies and measures.

**TABLE 1**  
**FISHERIES LEGISLATIONS, MALAYSIA**

Types of Legislation	Acts and Regulations	Detailed Provisions and Specification of Activities
A. Legislations on National Jurisdiction.	<ol style="list-style-type: none"> <li>Emergency (Essential Powers) Ordinance No. 7 1969.</li> <li>Continental Shelf Act 1966</li> </ol>	<ul style="list-style-type: none"> <li>♦ Limits territorial waters to 12 nautical miles.</li> <li>♦ Rights with respect to exploration and exploitation of natural resources vested in Federal Government.</li> </ul>
B. Legislations on Management.	<ol style="list-style-type: none"> <li>Fisheries Act 1963.</li> <li>Merchant Shipping Ordinance 1952.</li> <li>Fisheries (Cockles and Conservation &amp; Culture) Regulations 1964.</li> <li>Fisheries (Maritime) Regulations 1967.</li> <li>Fisheries (Prohibition of Method of Fishing) Regulation 1971.</li> <li>Fisheries (Prohibition of Import of Piranhas) Amendment Regulations 1979.</li> <li>Fisheries (Amendments) Regulations 1980.</li> <li>Fisheries Act 1985.</li> </ol>	<ul style="list-style-type: none"> <li>♦ Provides power to the Federal Minister to make regulations for the control of marine and estuarine fisheries.</li> <li>♦ Controls the licensing of fishing vessels.</li> <li>♦ Licensing for collection of cockles and for direct purchasing of cockles; regulate minimum size of cockles to be harvested.</li> <li>♦ Provides detailed provision and specification of activities requiring licences.</li> <li>♦ Prohibit use or possession of certain types of destructive gear.</li> <li>♦ Prohibition of import, sale and cultivation of of Import of Piranha</li> <li>♦ Specified allocation of fishing grounds, larger mesh size and licence limitation.</li> <li>♦ Provides power to the Federal Minister to make regulations for the control and management of marine and estuarine fisheries. Imposition of heavy fines on illegal foreign fishing vessels.</li> </ul>
C. Legislations on Development.	Lembaga Kemajuan Ikan Malaysia Act 1973.	<ul style="list-style-type: none"> <li>♦ To promote and develop effective management of fishery enterprises, efficient marketing of fish, credit facilities; to promote, stimulate facilitate and undertaken economic and social development of fishermen's associations.</li> </ul>
D. Legislations on Investment.	Investment incentive Act 1966.	<ul style="list-style-type: none"> <li>♦ Provides certain incentives for both domestic and foreign investment in pioneer fisheries-related industries.</li> </ul>
E. Legislation on Organization.	<ol style="list-style-type: none"> <li>Fishermen's Association Act 1971.</li> <li>Fishermen's Association Regulation 1972.</li> </ol>	<ul style="list-style-type: none"> <li>♦ Established a system of Area, State and National Fishermen's Associations.</li> <li>♦ Introduced certain controls to ensure that the Directors of the Board shall be primarily fishermen.</li> </ul>
F. Legislation on Fishing Vessels and Merchant Shipping Regulations.	<ol style="list-style-type: none"> <li>Boat Rules 1953.</li> <li>Merchant Shipping (Amendment) Act 1973</li> <li>Examination of Engine Drivers Rules 1953.</li> <li>Examination for Certificates of Competency and Efficiency (Amendment) Rules 1974.</li> </ol>	Registration, licensing, construction and equipment standards for fishing vessel, and manning and certification requirements.
G. Legislation on Pollution	Environment Quality Act 1974.	<ul style="list-style-type: none"> <li>♦ Pollution prevention and control under the responsibility of the Environment Division, Ministry of Science, Technology and Environment.</li> </ul>

**TABLE 2**  
**ORGANIZATION STRUCTURE OF THE FISHERMEN'S ASSOCIATION IN MALAYSIA**



**TABLE 3**  
**PRESENT STATUS OF PERSATUAN NELAYAN KAWASAN (PNK)**  
**AND SYARIKAT KERJASAMA NELAYAN (SKN),**  
**PENINSULAR MALAYSIA, 1975-89**

	Persatuan Nelayan		Syarikat Kerjasama Nelayan	
	1975	1989	1975	1989
Number	26	62	74	40
Membership (persons)	10,637	46,957	15,475	13,301
Share capital (\$)	137,540	454,210	785,630	945,360

Source: Lembaga Kemajuan Ikan Malaysia (LKIM), 1989.



## ACTIVITIES OF JAPANESE FISHERIES MANAGEMENT ORGANIZATIONS ESTABLISHED BY INITIATIVES OF FISHERMEN'S GROUPS<sup>1</sup>

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### ABSTRACT

The paper examines the genesis, characteristics and activities of Fisheries Management Organizations (FMO) established in Japan on the direct initiative of fishermen's groups. There are now over 1,300 such organizations whose basic aim is the collective management of the resources, fishing grounds and fishing operations; almost all FMOs are managed or guided by individual or groups of fisheries cooperatives. They are presently concerned mainly with sedentary coastal resources rather than more mobile offshore species. Their activities fall into two main groups - those designed to promote the more effective use of fishing grounds and those directed at the maintenance of fish market prices. The former include rotation and other systems to prevent overcrowding on the most productive fishing grounds and cooperative pooling mechanisms. The market oriented measures include catch restrictions through vessel quotas and non-fishing days and pooling of catch sales values. Other FMO management measures include voluntary agreement of mesh sizes increases and of minimum body lengths considerably greater than official prefectural regulations. Most of the activities of FMOs are, in effect, primarily designed to maintain fishermen's incomes but also provide the basis for sustainable resource management and stock reproduction.

### INTRODUCTION

In 1977, the term "resources management type fisheries" was first coined to show a new direction in which Japan's fishing industry should proceed. This was the year when the concept of the 200-mile exclusive economic zone became recognized worldwide. In the 1980s, the national and local governments began to use this term, after which it gradually found its way into fishing villages. At present, the phrase is recognized as one of the commonly-used terms in the fisheries terminology.

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<sup>1</sup> This is an abbreviated version of a longer and more statistically detailed paper.

However, the concept of resource management itself has a long history in Japan, and it has been applied to all kinds of fishing operations and their management by administrative authorities, whether national or prefectural. Actually, today there are perhaps more than enough regulations aimed at some kind of resource management.

In view of the above term "resources management type fisheries" should be used and interpreted in a more modern context, as many of the conventional national and prefectural government-enforced regulations have failed to control overfishing in both a biological and economic sense, and excessive investment in the resources and fishing grounds. Today's fishery and resource management activities boil down to fishermen-initiated regulations exercised by means of mutual surveillance among fishermen within the existing legal framework of fishing rights and licenses.

Clearly there is a limit to the power of the administration when it tries to prevent law-breaking over such an extensive area for mostly invisible activities. Even a relatively simple fishery regulation activity would require a tremendous expenditure if one tried to enforce it one hundred percent. This is a form of economic activity which can be achieved only through agreement of all the parties concerned as well as a successful mutual surveillance system.

The best way to address the important issue of "mutual agreement of all the parties concerned" is to increase the fisheries-related income for all the fishermen participating in any particular regulated fisheries activity. The key to determining either success or failure of fishery management would rest on how to adjust discrepancies in profit that might result from differences in fishermen's age, skill, boat's size, and fishing method, while developing new uses of the available resource.

When fishery management is based on the initiative of participating fishermen, the issue of resource distribution must be faced. The most difficult challenge, therefore, does not lie in the achievement of MSY or MEY, but rather in finding an agreeable agenda for all participants (along with management standards and methods for achieving it) under the current conditions. Looking at actual cases of resource management type fishery, it is quickly evident that the concerned parties had held many years of heated discussions before establishing a new form of managing organization. Even when dealing with a very familiar fishing ground or a resource type within a single fisheries cooperative, reaching an agreement as to resource management is not an easy task.

## CURRENT STATUS OF FISHERY AND RESOURCE MANAGEMENT

The Fishery Census (conducted every five years) of November 1988, included fishermen-initiated fishery management as a survey item for the first time and cast new light on the actual status of this movement.

The Fishery Census defined a fisherman-initiated fishery management organization to be "an entity made up of a number of fishermen who are engaged in the same mode of fishing or who share the common fishing ground and an entity which controls or manages

the fisheries resources, fishing grounds or fishing operations". In short, a fishery management organization aims at collective management of the resources, fishing grounds and fishing operations; is formed by and upon the voluntary will and agreement of fishermen; and it acts in accordance with pre-set rules. The Census indicated that there were 1,339 such organizations in Japan (compared with 2,148 coastal district fisheries cooperatives).

#### (1) Year of Establishment of Management Organizations

The Census revealed that about a quarter of all fisheries management organizations (FMOs) were established between 1949 and 1952, and 1949 in particular. It was the time when the Fisheries Cooperative Association Law and Fishery law were also entirely revised in the course of rapid democratization during the post-war years in Japan. As fisheries cooperatives underwent reorganization according to these laws, it is likely that FMOs were established in large numbers throughout Japan. In keeping with numerous democratic reforms made during this post-war era, some FMOs were newly established, while many of those existing in pre-war times were reorganized in order to make them match the new legal requirements.

The 1950s and the first half of the 1960s were characterized by the very small number of newly-established FMOs. The number began to increase again in 1965, during the latter half of the era of rapid economic growth, and this trend continued until the end of this rapid growth era in 1973. The First Oil Shock of 1973 and the worldwide adoption of the 200-mile exclusive economic zones in 1977 drastically changed the environment in which the fishery industry operated. Faced with a number of major changes, new FMOs were established at an even greater rate. The average number of FMOs established each year during 1973 and 76 was 33.5, 26.8 for 1977-80, 42.5 for 1981-84 and 26.3 for 1985-88. The average number for these entire periods is 32.3. It is noteworthy that out of the total of 1,339 FMOs present today, 41% of them were established in the years immediately before or after the introduction of the 200-mile exclusive economic zone.

#### (2) Structure of Management Organizations

There are many different types of FMOs. Some are extremely small with 10 or fewer participants, while others are huge with 200 or more participating fishermen. A great diversification in size and geographical distribution characterizes these management organizations.

The mode of fishing operations, which is one of the target subjects of fishery management, is characterized by the large majority (69%) being engaged in a single mode of fishing, while 26% are engaged in 2-4 different species of fish/shellfish, 2% engaged in 5-10 species, 3% in more comprehensive fishery management controlling over 10 species of fish and shellfish.

Despite the great diversification, some features are commonly seen in most of the FMOs. First of all, they are mostly based on existing fisheries cooperatives. Still, the relationship between cooperatives and FMOs varies greatly. The Fishery Census classifies the various relationships into the following categories: (a) FMO is managed by a single fisheries cooperative (or FMO is the fisheries cooperative itself); (b) FMO is formed by

groups of fishermen according to the bylaw of fisheries cooperatives; (c) FMO is organized by the will of fishermen who are members of a fisheries cooperative; and (d) FMO is founded by other organizations.

These different categories are shown in Table 1. It indicates that almost all fishery management organizations are formed under the guidance or initiative of fisheries cooperatives. Even those FMOs founded by other organizations are also associated with or subsidiary bodies of fisheries cooperatives. Therefore, it is clear that fishery management in Japan's coastal fishing grounds cannot exist without the collaboration of fisheries cooperatives or their affiliates.

### (3) Spread of Fisheries Management Organizations and Participation by Fishermen

The largest number of FMOs are found in Hokkaido and the Pacific North Coast, where FMOs are present in 90% of all the fishery districts. The Seto Island Sea Coast, on the other hand, shows the smallest distribution of FMOs at 22%. The distribution ranges between 32-55% for all other fishery districts. On the whole, there are more FMOs in northern Japan than in western Japan. However, these discrepancies are narrowing in recent years because the number of newly formed FMOs is decreasing in Hokkaido and the Pacific North Coast, while that in Central and Western Japan, as well as the Seto Inland Sea Coast in particular, is showing a marked increase.

The Census also indicates the extent of fishermen's participation in these organizations. The type of fishing (and fishing gear) indicating highest percentages are "Shellfish collection" and "Coastal trawl nets". In these categories, the majority of fishing households participate in at least some kind of management organization. The fishing types showing the next highest participation are coastal gill nets (30% range), patch-type boat seines (20% range), offshore trawl nets (10% range), followed by seaweed collection, small set nets, coastal tuna long lines and boat seines.

In terms of overall fishermen's participation, it is assumed that half of the total of 190,271 fishing households participate in some kind of FMO, despite some participation overlap.

## FISHERMEN-INITIATED FISHERY MANAGEMENT METHODS

There is clearly quite a variety in the size and form of management type fisheries, which in fact can be best characterized by their versatility. Because of this, it is not possible to discuss this subject in general terms. The paper, therefore, concentrated upon four aspects: effective use of fishing grounds; market-oriented measures; management of the recruit stock; and management of the stock reproduction. These four areas constitute the foundation of fisheries management on fishermen's initiatives, but diversification is again the key in their development.

(1) Effective Use of Fishing Grounds

(a) Maintaining order in fishing operations

Of the many fishing grounds available today, only a few can be called truly profitable. When a large number of fishing boats congregate in these very few excellent fishing grounds, overcrowding sometimes disrupts fishing operations. Maintaining order in fishing operations is a form of fisheries management aimed at preventing overfishing in good fishing grounds. All the parties concerned set up rules for the use of the fishing grounds and try to maintain the necessary standards in labour efficiency.

This, more or less, has been the prototype for fishery management since ancient times. It is these examples of ancient practice of fishery management which attract our attention as they are interpreted in a new light and as they become increasingly more sophisticated in the modern environment.

Example: Ohse Sea Bream Line Trawl Fisheries Association (founded in 1960) in Yamagata Prefecture in the Japan Sea North Coast.

In this example, more than 60 line trawlers from several regions carry out an orderly use of the fishing ground according to the written rules. The fishery management in this case is essentially the use of the fishing ground by a rotation system. Based on this general agreement, detailed rules are made as to the specifications of the allowed fishing gear, their use, operating period, hours of operation, and others together with penalties for offence. As indicated by the very detailed rules provided by this association, the fishery management is conducted on the basis of sound experience of past operations. Their method, however, is characterized by the fact that it is a passive one aimed at the maintaining of order.

(b) Cooperative use of fishing grounds

When abundance varies from one fishing district to another, it is necessary to position the boats so that they will have an equal marginal production in each fishing district, but this principle can not be applied if free access is allowed to fishing grounds. It is caused by the principle of equal average production, rather than equal marginal production. In this sense, a fishing boat fishery is sometimes quite uneconomical in its use of fishing grounds. There is greater economic loss if the difference in abundance is great from one fishing district to another.

This can be illustrated by the case of fisheries cooperatives which solved the above problem by adopting a system of pooling total sales. Under this system, all fishing boats are positioned systematically under a leader (chosen from among participating fishermen). One typical example is trawling for Pacific cod by a fisheries cooperative in northern Akita Prefecture in the Japan Sea North District.

Before adopting the pooling system, all 19 trawlers used to congregate in the particularly good fishing ground known as "Taraba" with resultant excessive

competition. When the new pooling system was introduced, the number of operating ships was reduced to six and the remaining 13 were sent to nearby fishing grounds. It was known from experience that the total catch would not increase greatly when more than six boats operated in the Taraba. The 13 boats which operated in the less abundant areas contributed to increase the total catch. The total operating cost of the 19 boats remained the same, so the total catch value of all 19 boats was increased dramatically.

## (2) Market-oriented Measures

Fishermen-initiated catch limits are intended mainly to prevent a sudden drop in the value of traded fish. Some of these catch limiting efforts are similar to resource management. The two most noteworthy catch-limiting measures are the individual quota system (allowable catch limit per boat) and the pooling system.

### (a) Individual quota system

An individual quota system as a means of resource management is, for example, enforced by the Yokohama City Fisheries Cooperative for coastal trawl nets in Kanagawa Prefecture of the Pacific Central Coast.

Triggered by the sudden decrease in the value of mantis shrimp following a bumper catch during the latter half of the 1970s, this cooperative started to limit the total catch by allocating individual quotas to each boat in 1977 in order to restrict the supply to the market. Initially, the quota per boat per fishermen was set to be 200 units across the board (the "unit" used was for the processed product. One unit of product requires about 500g of unprocessed mantis shrimp). This quota has been changed to 150 units for a one-man boat, 200 units for two-man boats, and 250 units for three-man boats. Changing the quota reflecting the difference in production capability between different boats is an important point in reaching an agreement from all the participating fishermen. The cooperative regulates the total catch, while adjusting quotas between boats.

The total catch control was originally started for the purpose of maintaining prices. It is worth noting that this original method was gradually developed into achieving other economic purposes. For example, a new work day system was introduced later, i.e. two days' operation followed by one day's rest. Because of the assigned quota, it was no longer necessary for all the boats to sail every day, thus they could save both fuel cost and labour cost.

So far, the catch limits necessary for maintaining the market price of fish are below the levels required to maintain the resources and the quotas determined during the early years of the inception of the concept are still maintained. However, management system is now potentially available to respond to even worsened resource conditions that might result from unfavourable environmental conditions.

(b) Maintaining high values of fish by means of a pooling system

A typical example of a pooling system is carried out by sergestid shrimp boat seine fishermen in the Suruga Bay, Shizuoka Prefecture along the Pacific Central Coast. During the 1960s, the fisheries cooperative in the area introduced a system of pooling the cash value of the catch and its equal distribution for the purpose of maintaining the proper fish price, and this system has been preserved to this day.

Two boat owners and five captains from each of the three fishing districts make up the Fishing Management Committee. The Committee has absolute control over the operation of all the boats and determines the time to start fishing operations, fishing ground and allowable catch limit. In fact, it determines all aspects of a boat's operation. The product pooling system gives economic backing to support such wide-ranging activities, just as the earlier case of trawl net fishery did in northern Akita Prefecture.

The central aim of this type of fishery management is the maintenance of fish prices. In recent years, however, there is increasingly greater concern about resource management, and the entire system of management is gradually shifting to a more all-encompassing one, rather than solely the initial market-orientated targets.

(c) Improving the catch quality with a pooling system

In the case of coastal sardine trawl netting, the Toyohama Fisheries Cooperative in Aichi Prefecture along the Pacific Central Coast also carries out a pooling system to maintain the fish prices, but is characterized by a more progressive approach to raise the quality of the catch.

At a time when large purse seiners produced well over a million tons of sardines, coastal trawl netters, whose lower production efficiency resulted in low-quality, low-price sardines for feed purposes, could not survive. It was necessary for these smaller coastal trawl net fishermen to produce more fresh sardines fit for human consumption. The Toyohama fishermen achieved this by introducing a pooling system which also involved storing the catch alive in the fish tanks to achieve greater cooling efficiency; and frequent communication between the offshore boats and marketing officers on land to systematically control the amount of catch in accordance with fluctuations in the trading room. The introduction of these measures has proved to be a great success. Excessive competition based on free access had forced fishermen to concentrate on fishing, leaving little time for such troublesome tasks as the storing of the catch live.

The management organization holds a meeting every weekend to determine if the pooling system is to be exercised the following week and to constantly confirm the wishes of participating fishermen. In this way, the management organization can maintain a flexible regulatory system in keeping with the changing conditions of the stock, which is particularly notable for pelagic fish.

### (3) Management of the Recruit Stock

All across Japan, there are many examples of efficient management of the recruit stock. Most of the examples, however, involve resources living in the coastal reef such as abalones and Japanese spiny lobsters as well as the surf clam, ark shell and other sedentary species living in more extensive areas. As regards other more mobile fish resources, there are not many cases whose efficiency can be confirmed objectively.

The mesh size increase adopted for trawl netters by the Haragama Fisheries Cooperative in Fukushima Prefecture along the Pacific North Coast is a noteworthy attempt in fishery management. The mesh size increase movement of this cooperative was initially started through the voluntary wishes of individual flounder gill netters, which then spread to a more systematic one involving the entire cooperative.

It has long been proved scientifically and it is common knowledge among fishermen that an increased mesh size is effective in increasing the catch. Despite such general knowledge, many fishermen do not readily accept increased mesh sizes because most of them cannot withstand reduced income for several years until the small fish grow to a catchable size and because there is no guarantee that they would catch the larger fish. They fear that the small fish they spared by increasing the mesh size would be caught by other fishermen who would continue to use the small-mesh size nets. With this kind of thinking, there is no chance that individual fishermen would voluntarily start a mesh size increase campaign. This action can be enforced only as a collective action by all the participating fishermen provided that they have enough financial backing to withstand an initial reduction in income.

Notwithstanding these general considerations, the mesh size increase movement occurred spontaneously among the Haragama fishermen because increased mesh size led to greater efficiency in catching larger fish which had greater market value and to reduced labour. In short, both technical and economic conditions promoted the feasibility of mesh size increases. The campaign was also a success because the smaller mesh size had spared many larger fish, and therefore, there was abundant stock when the mesh increase movement was introduced. This is reported to occur fairly often with flounder, halibut and other similar species, as evidenced by many similar developments in other fishing districts. Such a favourable turn of events can trigger a shift to the resource management type fishery.

In the case of very mobile fish species, the management of the recruit stock usually involves fishing areas exceeding the coastal area under the control of any particular fisheries cooperative. Generally speaking, it is known that greater efficiency is achieved by covering as wide an area as possible, thereby covering the entire growth phases of the relevant species. In this sense, one notable achievement is found in the fishery resource management movement of the "Committee for Planning about the Future of Kagawa Fisheries" organized in Kagawa Prefecture in the Seto Inland Sea Fishing District in 1983. Among the many projects this Committee is engaged in, one of the most important is the campaign for "Do not catch or sell smaller fish" started in 1986. Over 29 species are designated to be subjects of this campaign. Needless to say, simply designating the species or making a slogan is meaningless unless the campaign is actually put into effect.



In this regard, the Kagawa Committee offers an innovative approach. First of all, they have devised a system to delegate authority for the enforcement of their rules through all the fisheries cooperatives and their lower organizations in the Prefecture. Secondly, after repeated negotiations with all other organizations in the Prefecture, they decided that their self-imposed regulations should be applied to more species than those under national or prefectural regulations, while maintaining the minimum size of the allowable catch at a higher level. For example, the body length of catchable black sea bream is 6cm according to the prefectural fisheries adjustment regulations. It is 13cm in the self-imposed regulations. In the case of Kuruma prawn, it is 6cm for the former, but 12cm for the latter.

#### (4) Management of Stock Reproduction

While the above management of the recruit stock is primarily aimed at increasing the resources by not catching smaller fish, in effect it also serves an equally important purpose of promoting reproduction by increasing the number of adult fish. However, there have not been many efforts to establish long-range projects aimed at increasing stock reproduction other than in the case of sedentary resources in coastal areas.

In the case of more mobile resources, it is only in recent years that applications of such efforts are reported. In this sense, the sand lance stock reproduction efforts carried out in the Ise Bay in the Pacific Central Coast is a pioneer case. This project is participated in by more than 200 fishing units of 600 fishing boat seiners in both Aichi and Mie Prefectures. Since 1990, the large number of participating fishermen have held meetings to decide the last day of the season. Although closure of the season means income reduction, they abide by the set rule in a unified manner. Their action is based on the premise that at least 400 million adults, but preferably, one billion adult fish, should be left intact to preserve the stock reproduction. It should be noted that the success of this movement has been brought about because of a favourable background, i.e. the prefectural marine resources testing laboratories offering their scientific information, and many years' of ongoing fishery management activities before 1990 aimed at the preservation of the stock reproduction by controlling the fishing season.

#### (5) Interaction between various forms of Fishermen-Initiated Fishery Resource Management

As regards the several different methods of fishery resource management, effective use of fishing grounds and market-oriented measures can be practised without changing the status quo of the biological resources. On the other hand, management of the recruit stock and management of stock reproduction are characterized by the fact that there is no waiting time for the growth, spawning and reproduction of the biological resources where the effect of management can be felt almost immediately; in this sense, these methods are easily acceptable by fishermen. They can also be easily practised even when the resources are not being overfished, while achieving an increase in income.

It is possible to carry out all the methods concurrently. It is also possible to start with the first two and gradually shift to the others. For example, fishery management can be started with the initial purpose of maintaining the proper fish price, but once conditions are

right for the introduction of the individual quota system, it is possible to develop the initial movement into stock management methods by adjusting the allowable quota by the catch limits corresponding to the growth or reproduction of the stock.

In any case, improved stock reproduction is the highest goal in any fishery management effort, and it can only be achieved gradually.

## CONCLUSION - CHALLENGES FOR THE FUTURE

In Japan, fishermen-initiated fishery and resource management organizations have been established nationwide on the basis of the social and economic structures of the existing fisheries cooperatives. They are centred around the coastal sedentary resources, such as abalone and Japanese spiny lobster, or other sedentary species in the sandy and muddy bottoms such as scallop, surf clam and mantis shrimp. At present, they do not cover very mobile species, especially offshore pelagic fish.

Their main goals are effective use of fishing grounds and market-oriented measures and it is only in recent years that efforts have been made aimed at recruit stock management. In order to ensure long-term stable catch, efforts aimed at stock reproduction management are also indispensable, but in many cases there are difficulties involved in collecting scientific background, indispensable to guide the whole movement.

In terms of the management organizations, the existing ones are not big enough. Due to the greater number of species to be considered, and increased sophistication in the management methods, larger management organizations consisting of several fisheries cooperatives should be developed.

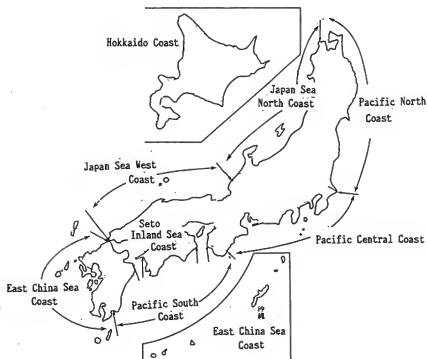
Establishment of larger organizations, however, is no easy task. Fishing methods and the use of fishing grounds vary greatly between fishing cooperatives and households. The resource and the management approach also differ from one case to another. In addition, involvement of larger fishing districts would result in greater discrepancies in profit and loss. Adjustments of the number of operating boats, fishing season, fishing area and mesh size, or the introduction of the rotation system in fishing or a pooling system of the total catch should be planned carefully to maximize the benefits while minimizing the drawbacks of forming larger management organizations.

Table 1: Number of FMOs by type

Type of FMO		Number of FMOs	%
Total		1,339	100.0
Fisheries cooperatives	*1	435	32.5
Fishermen's group	*2	532	39.7
Voluntary organ.	*3	237	17.7
Others organ.	*4	135	10.1

- \*1 A fisheries cooperative itself.
- \*2 A group of fishermen which was established by the bylaw of the fisheries cooperative.
- \*3 A group of fishermen which was organized at the will of fishermen concerned.
- \*4 FMO which was established by a group of neighbouring fisheries cooperatives, or a group of fishermen from several neighbouring fisheries cooperatives.

Fig. 1 - Map showing the location of sea coasts



## **ECONOMIC EFFECTS OF FISHERY MANAGEMENT WITH PARTICULAR REFERENCE TO THE STABILIZATION OF FISH PRICES**

by

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### **ABSTRACT**

The major objective of fisheries management is to seek the long-term sustainable use of the resources. In this regard, it is important that economic factors are taken fully into account when planning the exploitation and utilization of fishery resources. Three main economic effects of exploitation may be distinguished - it provides income for producers and food for consumers and creates a need for a mechanism to channel products, via processors and traders, to consumers. In all these cases, the essential pivot of the system is price which reflects the relative scarcity of the good and changes in response to variations in supply and demand. These market forces should be used to support management strategies and programmes. In this respect, price stabilization schemes are of particular relevance and, in many instances, have proved to be of major interest and benefit to fishermen. The paper next discusses the pros and cons of the various price formation systems which exist in fisheries, ranging from direct sales, auctions and contracts to commission sales. Special emphasis is placed upon the need for accurate market information and on its efficient communication to all concerned with the smooth functioning of the marketing system. Case studies of successful price stabilization and marketing schemes operated by fishermen's cooperatives are briefly reviewed in an appendix.

### **1. Purpose of fishery management and management objectives**

#### **1.1 Sustainability**

The principal purpose for subjecting fishery resources to management measures is to achieve a sustainable use of the resource in the long term. Other purposes could be the rebuilding of stocks in the medium term or calculated over-exploitation in the short term to meet an extraordinary situation. Sustainability of resource use means that the needs of the present generations are met without compromising the ability of future generations to satisfy their needs. Scarcity is a general characteristic of natural resources such as fish and therefore it is possible - as past experience has shown - that economic pressures undermine the realization of sustainability in the future. It is therefore essential to take fully into account economic dimensions in the exploitation and utilization of fishery resources. Since,

in the past, over-exploitation has made it necessary to introduce management programmes for the rebuilding of stocks, it is necessary to keep this particular aspect in mind although the main emphasis of this paper will be on sustainable development.

The theme of the Expert Consultation is the Development of Community-based Coastal Fishery Management Systems. Therefore, the arguments will focus on small-scale fisheries and will not consider high seas or long distance fisheries. Until recently - say a decade ago - small-scale fisheries used to be praised for their capability of maintaining sustainability and preventing the collapse of fish stocks. Nowadays, one would have to be much more careful with such statements.

For the connection between present use and future sustainability or, in other words, present and future values of a resource, the concept of discounting is usually used in economics. However, in these cases it is the present owner using the discount rate to equate present and future values. In the concept of sustainability such a procedure is not applicable because the future value for a future generation will materialize in a "future presence", a situation which will depend on the action taken on the current presence. Nevertheless, if the concept of sustainability is taken seriously, today's resource users should not attempt to discount the value it may have for future generations. Hence, one could only say that the resource should still exist, and not what its desired size or value (maximum or optimum) should be. For the present it means that the resource should not be depleted but exploited at a level which may be defined as maximum, optimum or otherwise.

## 1.2 Economic dimensions of fishery resources use

Three basic effects in economic terms may be distinguished in the use of fishery resources (assuming a reasonable developed market economy):

- (a) Exploitation yields income for producers;
- (b) Animal protein food becomes available for consumers;
- (c) Material/product becomes available for transactions by processors and traders.

All these dimensions result in economic pressure on the resource, usually with a combination of factors. Management measures must recognize these factors and, if necessary, include provisions to deactivate or counterbalance them. A brief summary description of these factors is sufficient:

- (a) Fishermen find gainful employment and with increases in catch, income will normally increase. As a result, fishing effort and the level of the stock's exploitation will normally increase, possibly leading to over-exploitation.
- (b) Consumers have a preference for animal-protein products and are willing to buy fishery products either directly from the fishermen or from the processors and traders. The demand pull will normally reach the level of producers and stimulate increased fishing effort and pressure on stocks.
- (c) There is a need to channel products from producers to consumers, money from consumers to producers and information in both directions. As a

consequence, there is an intermediate stage of transformation and transaction, for which producers provide the material and consumers provide the demand. Both the pressure of demand, in general, and distortions due to non-economic preferences can result in serious repercussions for fishery resources.

In all these cases the core issue or pivot of the system is the price and, due to its importance, price formation is the critical area not only for the economic operation of exploitation and utilization of fishery resources but also for their management. Prices reflect the relative scarcity of a good and change according to supply and demand. They have to be flexible in order to transmit changes in supply and/or demand. From this point of view the objective of price stabilization may be in conflict with the other goals mentioned above.

## 2. Efficiency of resource management measures

If the primary objective of fishery management is defined as the assurance of sustainable exploitation of fishery resources, it follows that the efficiency of management measures is defined as the achievement of this objective at the least possible cost. Such costs may include: scientific research of resources, monitoring and surveillance, administration, communications, sanctions and enforcement. It is generally accepted that the cost and benefits of pursuing sustainable fisheries management and development strategies should accrue to the fishing community; moreover, the extent to which the wider community may share in the cost and benefits will have to be considered in any given case. In fact, if consumers are considered as belonging to the group of beneficiaries as well as belonging to the group which can exert economic pressure on exploitation, it would only be logical to let them participate in sharing the cost. The same would be valid for processors and traders. Ordinary practice would then be to levy a tax which would eventually form part of the price. Cost savings which could be achieved by fishermen taking over some of the management support functions, e.g. monitoring and surveillance, should be credited to them. In applying a tax on sales, attention would have to be paid to the effects of this tax on the accessibility of products to lower-income consumers. Another difficulty would be the quantification of the management cost and its equation with tax revenue. A more symbolic levy which raises public awareness may be easier to administer. It could be called the "fish yen" and be collected in the same way as levies introduced in some other countries to finance promotion campaigns.

The efficiency of resource management measures will obviously be influenced by their adequacy in relation to the real situation and, before this can be achieved, there may be a need for collection of data, analysis and study, and possibly training of administrators and fishermen or leaders of fishermen groups.

## 3. Reasons for stabilization of fish prices

At first sight the reasons for stabilizing fish prices appear to be self-evident, in particular the desirability of stabilizing producers' incomes. However, it is necessary to consider the matter further, particularly with regard to the level at which to stabilize, and the time dimension of the price fluctuations or the income stabilization respectively. The ways in which governments can intervene in an attempt to stabilize prices paid to producers are basically: direct buying, price fixing or compensation payments. Whichever measure is taken

and for whatever duration, it is essential that the deviation from the situation of unimpeded supply and demand be kept as small as possible. If the distortion is too great the stabilization scheme will generate social costs and inefficiency. This is relatively obvious for the level at which prices are stabilized because it will influence factor use and product demand which may not be in line with economic reality. The time-frame for which stabilization is desired may be a daily, seasonally or yearly one. Negative effects are more likely to appear the longer the duration of the measure, whereas short periods allow more frequent adjustments, therefore avoiding long-term distortions. It should be made clear whether price stabilization is aimed at a definite level with no deviation, or whether it should be attained within a specified range.

A pertinent criterion for the functioning of a price stabilization scheme is the competitive situation of the market and this is valid for both government-supported schemes and those run by fishermen's associations or cooperatives. In this context, mention needs to be made of market share, capability of enforcing the scheme, production costs, product demand, prices of competing organizations and prices of competing products.

Other reasons for which price stabilization may be practised are reduction of trade margins and consumer prices.

#### 4. Price formation in fisheries

The sales systems which can usually be found in fisheries may be classified as follows:

- (i) Direct sales: Seller and buyer determine quantity and price in negotiation; or the seller indicates a price in order to induce the buyer to make an offer to buy. The transfer of ownership is effected without a specific organization of the sale or pre-established contracts.
- (ii) Auction: Buyers compete for the right to buy by making offers. There may be ascending or descending bids or offers made simultaneously, the latter probably being the more important method in Asian countries.
- (iii) Contract sales: Transactions details of which (prices, quantities, specific conditions) are established between buyer and seller beforehand, usually at the beginning of the fishing season.
- (iv) Fixed prices: Public administration or a sales organization fix the producers' price for a specific period before the fishing season starts. It may include a system whereby producers are compelled to sell to pre-determined buyers.
- (v) Commission sales: The consignee sells on behalf of the consignor and receives a commission, usually a percentage of the turnover, for his services. The consignee does not take title of the merchandise.

The advantages and disadvantages of any of these systems in a given situation have to be evaluated in the light of administrative requirements, speed of transaction, stabilization



of producers' income, influence on intensity of competition, possibility to cover, i.e. to control, a significant share of the market, etc. The suitability of any of the methods may change over time due to changing product characteristics, production and demand structure, etc.

With regard to their suitability in terms of price stabilization, contract sales and fixed prices are particularly suitable options, whereas auction and commission sales normally result in fluctuations of price. The reason is that auctions and commission sales are particularly suited to rapidly changing market conditions because they make clearance of the market easy through adjustments of the price level. The limits in this respect are glut situations when the supply of a product far exceeds the demand. The price instability inherent in auction and commission sales can however be reduced by increasing market transparency, information and measures which allow control of the quantity of the product on the market at a given point in time.

There are indications that intensity of competition between buyers can be increased through the proper organization of sales. This, in turn, can improve the earnings of fishermen through higher prices. There are also indications that in the same provincial area, at the same time of the year, prices for the same fish may vary up to a factor of three and it is felt that increased market transparency would lead to a harmonization of prices. Whether this would mean harmonization at the highest level - as very often implied when such questions are discussed - cannot be taken for granted. The mere information to fishermen that their catch would be worth more in a different location is of limited value, if they have no opportunity to sell there or if their bargaining position is not strong enough to change the buying merchant's price offer. Therefore, distribution of the information alone is usually insufficient to influence prices to the extent desired; it must be accompanied by other marketing improvement measures.

In larger markets, the diffusion of price information is of specific relevance in order to increase competition and it may be useful to review the role of secret bidding in auctions with regard to market transparency, particularly since it is already difficult enough in an open auction to determine what is the relevance of a price quotation made public. There should be no illusion that prices can be determined with great precision, but a fair indication of the price level may be all that is necessary.

Items for detailed review, prior to establishing a price information scheme, are how to determine, how to collect and how best to diffuse the information; it is also necessary to identify which are the possible constraints preventing increased market transparency from becoming fully effective.

Another way to strengthen the bargaining position of producers in the marketing process is to open alternative distribution channels. These may cover all, or any one, of the following phases:

- (i) Coastal wholesale operations (including purchasing, handling in the port, storage, packaging, processing, etc.);

- (ii) Transport inland;
- (iii) Inland wholesale operations (including receiving, packaging, storage and sometimes processing).

The chances of success in establishing alternative distribution channels and deriving the expected benefits need to be evaluated under the aspects of:

- product policy;
- price policy;
- physical location of sales points.

Above all, the effectiveness of an alternative channel needs to be assessed thoroughly. Abortive trials only cause frustration, confusion and waste of physical and financial resources.

Some of the documents prepared for this Expert Consultation make specific reference to the consideration of marketing and price stabilization at the time of forming the cooperatives which are now responsible for the management of fishery resources in their areas of operation (see appendix).

#### 5. Communication channels in fish marketing systems

The main purposes of communications in marketing are to:

- (i) Establish and maintain the trading contact necessary to complete a transaction;
- (ii) Convey persuasive messages to both trading parties so that an exchange can be agreed upon;
- (iii) Feed back results with respect to productivity, efficiency and effectiveness of marketing activities.

Purposes (i) and (iii) are pertinent to the present considerations. To be effective, marketing requires that information be transmitted accurately through the network of wholesale, retail, production, physical distribution and financing levels. The economies of communication-channel networks may be divided into economies of skill and scale. The former is evident and it is probably generally accepted that the specialist can undertake the tasks more efficiently than the non-specialist. Economies of scale can be achieved *inter alia* by minimizing transactions and making them a routine procedure, and also by bringing assortments to central markets, thereby tremendously reducing the buyers' searching efforts. If financial operators pool the uncertainty of future repayment on the basis of the present knowledge of credit risks, the hazards of financing business and household purchases can be kept under control. Communications reduce risk in general, whether the price risk of ownership, the physical hazards of inventory or as in the subject being discussed here, the risk of over-exploitation of the resources. Communication and information are critical for both fishery management and the stabilization of fish prices.

6. Conclusions

Market and other economic pressures are likely to influence the exploitation of fishery resources and therefore have an impact on the effectiveness of resource management schemes.

It is helpful to use market forces in supporting management schemes, e.g. in respects that are of major interest to fishermen such as price stabilization. In doing so, care needs to be taken to avoid possible side effects which may be considered undesirable from an economic point of view.

The total consideration of fishery exploitation, utilization and marketing aspects will tend to make resource management schemes more effective because flaws may be detected and eliminated and fishermen's participation ensured.

The availability of sufficiently accurate information and its efficient communication between all concerned is critical for the good functioning of the system.

**Case Studies with References to Marketing**

**Kobe FCA:**

Exclusive collection and marketing of cultured yellow tail by cooperative. Supplies feed and provides finance.

Achievement: Harvest and shipment of quantities stable for past 5 years and for 20 years no environmental problems in fish culture.

**Yokohama FCA, Shiba Branch:**

Production of mantis shrimp for sushi market requires stable supplies. Agreement between coop and consignees in Tokyo on daily quantities to be shipped. Fishermen catch, process (boiled, shucked and packed mantis shrimp) and deliver product to coop's collection centre by 19.30 hrs on the same day. The coop will ship product to consignees in Tokyo, Yokohama and Kawasaki.

Achievement: Rebuilding of almost depleted stocks and stable market conditions for high price, high quality product of very limited shelf life.

**Iwami FCA:**

The coop organizes the auction of all landings at Iwami (except laver) and seems to be able to achieve favourable prices inter alia due to proximity to important markets.

**Stardust Shrimp Coop, Suruga Bay**

Joint (pooling) sale of catch (stardust shrimp) and elimination of competition between ship-owners led to a stabilization of the market by daily adjustments of catch and landings. A rational deployment of fishing boats has resulted in a substantial reduction of fishing costs. The working conditions of the crews have been improved.

Achievement: Rational and sustainable use of the resource; however, scientific assessment of the resource required.

**Hamana FCA, Lake Hamana Clam Fishery**

Catch and size limits controlled through marketing via the coop's collection station and imposition of penalties for violation of the rules.

Common Fishing Rights Union, Kashinanada

The Namizaka Kyoki; Fisheries Cooperative which covers the inland fishery of the Tone River has introduced a common production and marketing plan for shijimi (corbicula) in order to avoid price fluctuations and to achieve equal allotment of catch and rotation of fishing grounds. For the glass eel fishery it has set up a fishing gear store, standardized the price and created a common marketing system.

An important point to be made when summarizing these cases is that the above-mentioned fishery cooperatives have instituted responsibility controls which not only cover the catch/exploitation aspects but also utilization and marketing aspects. In this context, reference should be made to pertinent chapters related to marketing in the papers by Messrs. A. Hasegawa and Y. Hirasawa. (FI:CFM/92/SP.2 and FI:CFM/92/CSR.5).

## **COMMUNITY-BASED FISHERY MANAGEMENT: TOWARDS THE RESTORATION OF TRADITIONAL PRACTICES IN THE SOUTH PACIFIC**

by

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### **ABSTRACT**

Community-based fishery management has a well established precedent in the South Pacific. In traditional societies a comprehensive range of management measures were deployed to avoid overexploitation and promote orderly use. Within groups individuals were assigned user-rights to harvest inshore stocks. This right also obliged users to act responsibly and within communally determined parameters. Social change and the advent of modern institutions has eroded the effectiveness of these traditional management systems and introduced fisheries management approaches have generally failed to prevent resource overexploitation. Decentralisation of decision-making in important policy areas, including fisheries, has been initiated in some countries. Although further decentralisation from the provincial/state level would be required to more fully implement community-based fishery management systems, this devolution would be generally consistent with existing policy. However, reorientation of management policies within fisheries administrations will be required and this could impede implementation of community-based approaches in some cases.

### **1. INTRODUCTION**

The South Pacific is a large and geo-culturally diverse region. It is conventionally divided into three broad sub-regions: Melanesia, Micronesia and Polynesia. Stretching from Palau in the west to French Polynesia in the east, the South Pacific has more than 20 independent, self-governing and dependent countries and territories. All of these countries and territories, with the exception of Papua New Guinea, are characteristically (i) small in land area and population numbers, (ii) composed of clusters of isolated island groupings, (iii) economically vulnerable, and (iv) heavily reliant on marine resources for subsistence and economic development.

Naturally bound by dependence on the sea, the region has a plethora of inshore fisheries resources (within reef areas and in coastal lagoons) together with extensive offshore

pelagic (principally, tuna) stocks that support a major international fishery.<sup>13</sup> In addition, some countries and territories have aquaculture and mariculture-based industries (e.g., Cook Islands, Fiji, French Polynesia and Kiribati). Traditionally, many South Pacific communities practised a rudimentary form of mariculture (e.g., in Papua New Guinea in the Manus Province holding sessile species and excess catches of finfish in pens) as a supplementary activity to fishing to ensure food security when fishing in coastal or open-sea areas was prevented by poor weather.<sup>14</sup>

Indigenous communities around the world traditionally used effective systems of resource management.<sup>15</sup> They knew the type of resources available and, with respect to animals, had a thorough knowledge of behavioural characteristics. Moreover, and significantly, communities made choices concerning resource use within sustainable limits (International Indigenous Commission 1991:1).

In traditional South Pacific societies the concept of fisheries management was well known and practised extensively.<sup>16</sup> Popular participation in the consideration and adoption of management measures was common. Consequently, both the acknowledged need for management and the nature of decision-making in many island societies provided a strong foundation for a community-based approach to management (i.e., the involvement of fishing communities in management decisions taking into consideration cultural values, traditional tenure arrangements and established marine use practices).

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<sup>13</sup> Longline, pole-and-line and purse seine fleets from more than 10 distant-water fishing nations (DWFNs) harvest these offshore resources, focusing fishing effort primarily within the exclusive economic zones (EEZs) of the region's countries and territories. These EEZs cover approximately 21 million km<sup>2</sup> of the Pacific Ocean.

<sup>14</sup> Pacific Islanders, like other indigenous communities throughout the world, attached high priority to food security in order to avoid starvation. To minimise risk, Pacific Islanders routinely and communally undertook measures designed to minimise the impact of disruptions to food supplies resulting, for example, from cyclones that periodically devastated parts of the region.

<sup>15</sup> For a comprehensive and extensive international collection of fisheries ethnologies, including eight South Pacific studies, see Gunda (1984).

<sup>16</sup> Johannes (1978) has detailed traditional fisheries management practices in the South Pacific. He points out that Pacific Islanders, traditionally, were well acquainted with the biological limits of marine resources and of the need for management. In this context, management is defined simply to be the initiation of measures to regulate the exploitation of resources in order to ensure their sustainable use.

Dependence on inshore fisheries resources as a primary food source meant that communities were acutely aware of the need to ensure proper use of these resources.<sup>17</sup> Indeed, communities recognized that failure to regulate the exploitation of inshore fisheries resources, many of which they knew were biologically fragile and therefore easily susceptible to overfishing, could prejudice the availability of food. Moreover, for similar reasons, communities also acknowledged the need to preserve reef environments and activities such as coral mining for house construction were not practised, and indeed, are not practiced today.

After this introduction the paper reviews traditional fisheries management concepts and approaches in South Pacific countries. This review is followed by discussion of some of the practical aspects of introducing community-based fishery management. In the next section an example of one society in Solomon Islands that engages effectively in community-based fishery management is provided. The paper concludes that revitalisation of traditional approaches to fisheries management as a basis for contemporary management should be considered, given the failure of introduced 'scientific-based' management systems to effectively regulate the exploitation in inshore fisheries.

## 2. TRADITIONAL FISHERIES MANAGEMENT

It is difficult to generalise about social organisation in South Pacific societies because of distinct differences between the more stratified, prescribed societies of Polynesia and Micronesia and the achievement orientated, ascribed societies of Melanesia. However, despite these differences, common features of fisheries management systems, traditionally practised by communities in the region, can be identified.

In South Pacific communities the concept of *res communes* ownership prevailed for important natural resources such as land, forests and fish.<sup>18</sup> Communities, or more precisely descent groups, not individuals, held property rights over these resources. By virtue of birth, or perhaps adoption and marriage, individuals were assigned resource user-rights within a

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<sup>17</sup> In traditional societies, and even today, most fish in the South Pacific is consumed fresh. Processing techniques utilizing sun drying and salt preservation were not well developed. This was principally because there was little barter or trade in fish, even in Papua New Guinea, where there was a densely populated inland region (International Bank for Reconstruction and Development 1965:11).

<sup>18</sup> An extensive literature exists on common property resource issues. Ciriacy-Wantrup and Bishop (1975) distinguish between *res nullius* (unowned resources) and *res communes* (common property resources). In South Pacific societies restrictions for management purposes generally existed with respect to the utilization of inshore fisheries resources, and as such these resources were owned communally.



group. However, they were not permitted, or able, to dispose of these rights as individuals did not possess title in the Western legal sense.<sup>19</sup>

In accordance with *res communes* principles of ownership, a community's fisheries property rights usually extended from the beach to the outer extremity of reefs. Tenure beyond reefs was less common, though it did exist in some instances. Ownership, therefore, normally covered a specific, well-defined geographical area.<sup>20</sup> These traditional arrangements worked well to exclude non-group members from acquiring user rights. Intra-group disputes concerning user-rights were probably fairly uncommon because of the clear understanding of individual rights and, in turn, responsibilities. Where such disputes did arise, local arbitration or similar practice was used to restore order. Challenges by rival groups, or poaching by neighbours, led to inter-group conflict, particularly when resources were scarce. Under these circumstances, retribution was common and considered legitimate.

Customs related to communal distribution of food had important implications for traditional fisheries management in the South Pacific. In general, communal distribution meant that waste was avoided and, at certain times, it was not necessary for all villagers to fish. Communal sharing of fish, within resource productivity limits, also enhanced food security, and in some societies individuals gained status and increased influence. As a result, the distribution of fish, by helping both to avoid waste and provide food security, mitigated against overfishing and contributed to the stabilisation of production by acting as a disincentive to increase it.<sup>21</sup> This is different today in places where there is a market economy which provides a strong incentive to produce surplus fish for sale.<sup>22</sup> Given the need for cash incomes, it is possible in some parts of the South Pacific that fish are sold even before subsistence requirements are met.

Because fisheries resources were jointly owned in South Pacific societies, resources were also communally managed. Consequently, there was, in most societies, a high degree of popular participation in decision-making to arrive at measures designed to manage fish stocks, although discussions were commonly guided by individuals reputed to have supernatural powers pertaining to fishing.

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<sup>19</sup> In the more stratified societies of Polynesia, and to a lesser extent in Micronesia, everyone did not have equal resource access. However, this stratification did not traditionally inhibit popular decision-making and consultation concerning important social issues.

<sup>20</sup> There was no distinction between items within an area, unlike instances that occur regarding land ownership, where one owner group may possess certain trees and another owner group the land in which the trees stand.

<sup>21</sup> This observation has also been made in International Indigenous Commission (1991:10).

<sup>22</sup> However, in Kiribati, Teiwaki (1988:9) notes that money derived from fish sales is often distributed in the same way that fish was distributed traditionally. Thus the concept of traditional practices of sharing and redistribution persist.

The right to use fisheries resources and communal decision-making about their management engendered a natural concern for their proper use. Penalties of various types within groups could be imposed if agreed measures were flouted, and this was usually accompanied by considerable social embarrassment. Irresponsible usage or lack of concern for agreed measures designed to protect resources from overexploitation was tantamount to denying future generations access to the resource, their heritage and birthright.<sup>23</sup> Thus, the need to manage fisheries resources was a strongly perceived social obligation whereby individuals exercised restraint and self-discipline with respect to resource use.

Obligations associated with individual user-rights usually involved a commitment beyond simple judicious resource use, including: (i) participation in decisions concerning resource allocation and management, (ii) agreement to abide by communally imposed measures designed to protect the resource, (iii) commitment to report infringements of agreed conservation and management measures, and (iv) participation in the performance of rituals designed to enhance resource productivity and longevity.<sup>24</sup>

Information, passed orally from one generation to the next, taught an understanding of the marine environment, fishing practices and the dynamics of inshore fisheries resources.<sup>25</sup> Among a range of issues critical for management, communities understood the impact of lunar cycles on resource availability, migration and spawning patterns, and the relationship between mangroves in coastal zones and fishery productivity. Possessing extensive traditional knowledge, communities were able to devise and implement fisheries management to foster, in modern terminology, rational usage. In Kiribati, as in other South Pacific countries, village elders, because of their extensive knowledge of resources, played an important role in traditional fisheries education and in proposing management measures. Moreover, individuals, well schooled in traditional fishing matters, achieved social status through this knowledge (Onorio 1985:145-6). The acquisition of this education was therefore considered to be highly desirable.

Traditional measures to effect fisheries management in the South Pacific were numerous and often related to traditional supernatural beliefs. These measures were effective in facilitating conservation and, as noted by Johannes (1978:352), almost every means of

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<sup>23</sup> The strong opposition to driftnet fishing in the South Pacific by island countries and territories partly stemmed from this consideration. It was feared that driftnet fishing could harm the viability of long-established longline fisheries in the region and impair the capacity of island countries to develop their own fisheries. However, a more fundamental and deeply rooted concern was for future generations to enjoy access to the resource and that, unless the present generation acted to protect it, charges could be made that the current generation had acted irresponsibly by permitting driftnet fishing to take place.

<sup>24</sup> Teiwaki (1988:22-35) has detailed some of the rituals practised by fishermen in Kiribati. Similar rituals have been described in other parts of the South Pacific (e.g., Papua New Guinea).

<sup>25</sup> The requirements and scope of traditional education and training in fisheries matters in Tokelau are discussed in detail (Office for Tokelau Affairs 1991:177-205).

fisheries management devised "...in the West..." was in use in the South Pacific centuries ago.<sup>26</sup>

The types of management measures adopted, *inter-alia*, by communities varied depending on geographical features, oceanographic conditions, resource availability, seasonal changes and population requirements. Some measures were widespread throughout the region (e.g., closed areas and closed seasons, particularly at spawning time) while other measures were more localized, designed to meet specific conservation needs (e.g., gear limitations). Furthermore, in some trap and net fisheries the need for adult fish escapement for spawning was recognized, and fishermen routinely returned large fish to the wild for this purpose.<sup>27</sup>

Traditional management measures were either general or selective in application. Closed areas and seasons, and bans on the use of gear, were common. Some of these measures included: (i) selective harvesting (e.g., prohibition on the taking of berried female lobster), (ii) tightly regulated harvesting of species easily susceptible to overexploitation or devastation by natural disasters (e.g., turtles and giant clams), (iii) seasonal or complete restrictions on the use of particular gear, (iv) spatial allocation for some gear types (e.g., traps), and (v) prohibition or limitation on the use of traditional substances for poisoning fish in enclosed water areas (e.g., using the *derris* plant root).<sup>28</sup>

The extent to which traditional management measures were effective in preventing overexploitation is difficult to assess. However, there appears to be little doubt that the adoption of such measures facilitated sustainable resource use in traditional societies, even in the face of increasing population pressure.

The relationship between fisheries management in traditional South Pacific societies and population change needs to be highlighted. As Johannes (1989:89) has noted, management measures were least developed in Melanesia because of low population densities

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<sup>26</sup> Teiwaki (1988:35) points out that I-Kiribati (in common with other Pacific islanders) maintained that they had a supernatural relationship with the sea as a result of their story of creation.

<sup>27</sup> Interestingly, Johannes (1978:353) states that Pacific islanders did not commonly use minimum size restrictions as a means of promoting conservation. While this restriction is common in other parts of the world and is an obvious conservation technique, it did not rank in importance in the South Pacific.

<sup>28</sup> Several species of *derris* are known in the South Pacific, but the most commonly used type for fishing is *Derris malaccensis*. Villagers sometimes farm the plant to ensure supply. When being used for fishing the root is crushed and placed in the water. The toxin released immobilises the fish and causes them to drown. In enclosed water areas (e.g., small fresh water lakes or marine rock pools) this fishing method is non-selective and, depending on the quantity of *derris* used and the size of the water area, can cause all fish in the water area to die. When used in inshore marine areas (e.g., on reefs) the effect of the toxin on fish populations is diluted and therefore less drastic.

and concentrations in coastal areas. Problems associated with resource overexploitation were therefore less common. Conversely, in Micronesia and Polynesia, because of more intense population pressure on inshore resources, there was a greater need for management. High population growth rates and the development of population concentrations (which might have resulted from either migration or high population growth rates) probably increased the incidence of intra- and inter-group conflict and forced the adoption of tighter management measures, and in some cases (e.g., Solomon Islands) outward migration. However, in Micronesia and Polynesia the opportunity and ability to fish in oceanic areas possibly acted to moderate social disruption resulting from dwindling supplies on inshore resources.

Although there was a marked division of labour between men and women in South Pacific societies, women traditionally played a key role in the fisheries sector in many communities, especially in the harvesting, processing and distribution of inshore resources.<sup>29</sup> In addition to gathering shellfish along the shoreline, women often in groups, fished within reef areas using nets or lines.<sup>30</sup> Women (and children) did not fish beyond the reef areas as fishing for oceanic species in more hazardous offshore areas was a male occupation. Men fished for food but, especially in Polynesia, also for sport. Decisions concerning the exploitation and management of inshore resources involved contributions from women, particularly in communities where women, either individually or as a group, enjoyed positions of privilege or status (e.g., in matrilineal societies).

Traditional institutions and modes of operation, including traditional approaches to, and measures for, fisheries management, are strained by social change and the process of modernization.<sup>31</sup> When change-induced stresses cannot easily be accommodated within evolving social institutions, a breakdown, or at least an erosion, of traditional practices results. In the South Pacific, as elsewhere, this situation has occurred, and will continue to occur. The impact on fisheries management has been to make traditional systems less effective and, in some cases, has caused almost complete disintegration.

Reinforcing the impact of social change, the advent of commercial fishing opportunities, particularly near urban areas, has hastened the disintegration of traditional management systems. Competing uses for inshore areas (e.g., in Kiribati between growing seaweed and fishing in coastal lagoons) has also impacted traditional systems (Teiwaki 1988:28). Moreover, intra- and inter-group conflict (in recent times including conflict with foreigners) concerning inshore fisheries utilization rights have arisen, often leading to private ownership claims. This situation has complicated patterns of usage.

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<sup>29</sup> See, for example, Yanaihara (1939:72) for a description in the Federated States of Micronesia.

<sup>30</sup> Pollnac (1985:194) has noted this point citing the need for women to combine child care with fishing activities as the primary reason for their non-involvement in deep-sea fishing.

<sup>31</sup> The dimensions and significance of social change in the South Pacific has been widely documented. No attempt is made in this paper to discuss comprehensively aspects of social change.

In traditional societies technological change was managed carefully and innovations were introduced within sustainable resource limits (International Indigenous Commission 1991:7). However, this careful balance between technological change and resource use in the South Pacific has not been maintained.<sup>32</sup> Innovations involving modern, efficient gear in the absence of effective management systems, have led to resource depletion.<sup>33</sup> The introduction of monofilament nets, motorized fishing craft etc. has produced impressive short-term results but has led to resource degradation in the longer term.

Johannes (1987) describes the impact of what he calls "...Westernisation..." on traditional conservation and management practices in the South Pacific. He succinctly summarizes the impact of colonialism and new institutions associated with the monetary economy both on these practices and on fishermen's attitudes and behaviour. He notes that introduced systems of centralised fisheries management have been largely ineffective and proposes that legislation designed to promote rational resource use should incorporate, when it is introduced, traditional conservation and management practices. This approach has merit, but to attempt to re-establish complete traditional management systems would be naive in terms of social change that has already occurred.

### 3. COMMUNITY-BASED FISHERY MANAGEMENT

The conventional approach to fisheries management usually pits the manager and the managed against each other in an adversarial-type relationship. Excluded from the decision-making process and often not appreciating the need for particular management measures, fishermen will attempt to circumvent them in order to maximize catches and, in turn, revenue. They will do this even though penalties exist for infringements.<sup>34</sup>

In normal circumstances fishermen are not involved in designing and implementing fisheries management regimes, though this situation is changing particularly in developed countries. Indeed, consultation between the managers and fishermen is often limited to an explanation by the managing authority as to the nature of management measures after they

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<sup>32</sup> However, there are cases where communities have acted on their own initiative to manage, albeit crudely, the influence of introduced technology. In Kiribati, pressure lamps and similar strong lights are not permitted to be used to catch flyingfish and underwater torches in the lobster fishery are banned. These communally-imposed measures are designed to prevent resource overexploitation and, in the case of lobster, to enable stocks to regenerate (Onorio 1975:145).

<sup>33</sup> Some well intentioned international programmes have focused intensively on craft and gear development for inshore fisheries in the South Pacific without concurrent and appropriate concern for management.

<sup>34</sup> The extent to which breaches of management occur will be determined principally by the effectiveness of the surveillance and enforcement of management measures by the administering authority, the level and nature of penalties, the willingness of fishermen to take risks and the market value of fish harvested illegally.

have been adopted and are in the process of being implemented. With the imposition of measures from above, fisheries managers rely on the goodwill of fishermen and legal sanctions for support. In the South Pacific fisheries administrators have tended to underestimate the importance of traditional knowledge and practices in formulating management regimes and they have therefore failed to benefit from this knowledge (Johannes 1989:90).

The involvement of fishermen in the development, implementation and supervision of fisheries management regimes has been widely practised in some countries (e.g., Japan) and is gaining prominence in other countries as a means of making regimes based on rigorous scientific foundation more efficient.<sup>35</sup> FAO (1992 forthcoming) has noted that community-based fishery management could lead to welfare improvements if it is possible to rehabilitate, or build on, traditional management systems. When fishermen are involved in attempting to solve problems associated with fisheries overexploitation, they become active agents for change in the process. They are likely to better understand the rationale and need for management, even though measures proposed might appear to disadvantage them, albeit in the short term. Moreover, it is likely that such regimes will be more cost-effective because, through participation, fishermen will ensure that measures are observed and surveillance and enforcement costs will, therefore, be lower.

In the South Pacific, although the effectiveness of customary institutions and values have been eroded in the course of social change, attempts to build on traditional experience and modes of operation for fisheries management, has merit. Community-based approaches to management essentially involve 'bottom-up' or 'grass-roots' planning. This means that communities would be involved in determining fisheries management measures, supervising their implementation and invoking penalties when management measures and guidelines are ignored.<sup>36</sup>

Several governments in the region have recognised the need to decentralise decision-making and authority in a number of important policy and development areas including financial administration, the public service, fisheries and forestry. Devolution of responsibility has involved transfers of power from national to provincial or state

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<sup>35</sup> The recognition of the importance of community-based fishery management is not new; for example, see Lawson and Robinson (1983). However, the concept is generating renewed international interest as a means of addressing fisheries management problems and to achieve sustainable resource use. Panayotou (1988:44-45) has considered the implementation of community-based fishery management systems, and has provided guidance on the steps that might be taken in order to reinstate such systems.

<sup>36</sup> Critics of community-based fishery management might argue that the most appropriate and efficient approach to management is one where individuals are explicitly assigned individual (private property) rights. In this way the allocation problem within groups is solved and fishing effort is limited in accordance with rational management practice. However, the assignment of individual rights to limit effort will not find general acceptance in most South Pacific societies because it is essentially a foreign concept. Other possible solutions to inshore fisheries management in the region therefore need to be found.

governments (e.g., Federated States of Micronesia, Palau, Papua New Guinea, and Solomon Islands) and, in at least one case for fisheries, further decentralisation to local (municipal) government councils (e.g., Cook Islands).

Governments have adopted a policy of decentralisation principally for political reasons. Their objective has primarily been to give people a greater role in decision-making and policy development.<sup>37</sup> Governments have also acknowledged that in traditional small-scale societies people were consulted on important matters and that their contributions were taken into account. Decentralisation has also been a priority for some South Pacific governments because of the failure of institutions established in the colonial period, and continued after political independence, to meet community needs. This failure has provided a strong incentive for governments to pursue decentralisation policies as an alternative development strategy. The devolution of fisheries powers to provincial/state or lower levels has enabled fishermen and related interest groups to be more closely involved in decisions concerning management issues.

To involve South Pacific societies more fully in community-based fishery management will require further administrative decentralisation. Management regimes would need to take account of traditional social organisation in respective communities, judging each case on its own merit. In reality this would involve the identification of leaders with influence, probably chosen along traditional lines as representatives of resource owner groups, who would be able to mobilise and organise communities to initiate measures for fisheries management. Possibly based on guidelines developed by government, communities would need to (i) identify fisheries requiring management, (ii) select measures to effect management, and (iii) determine conditions for exploitation in accordance with traditional values and usage. Responsibility for monitoring and control of these management regimes would lie within the resource-owning group, where traditional norms should elicit a high degree of voluntary compliance.

Disputes resulting from the introduction of community-based management regimes should be anticipated. Inter-group conflict may arise over (i) the identification of territorial boundaries, (ii) the possible termination of acquired or assigned fishing rights (as opposed to traditional rights) that neighbouring communities might claim, and (iii) poaching. Such inter-group disputes would require mediation. Governments should be prepared to provide such services.<sup>38</sup>

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<sup>37</sup> In some instances decentralisation has been politically necessary for nation building (e.g., Papua New Guinea). It permits flexibility in decision-making and provides a degree of autonomy to unite cultural groups which do not have a common political background.

<sup>38</sup> For example, the appointment of a special magistrate might be considered, or a person of similar standing. Precedents for this exist in some countries (e.g., Papua New Guinea) with respect to land administration and the settlement of claims. Kiribati has a system whereby village elders well versed in local culture and customs, but having no legal training, act as land court magistrates (Teiwaki 1988:40).

Intra-group conflict should be handled internally in communities, though in cases where traditional patterns of authority have been destabilised through social change (e.g., migration and commercial fisheries development), this may be difficult, though not an impossible task.

In support of community-based fishery management, a strong extension input from government is likely to be necessary in order to realise its full potential. In particular, extension officers will need to monitor progress after communities are given management responsibilities. Reorganisation within national and provincial/state fisheries administrations might be required to meet increased demands placed on extension service units.

Although an attractive option, community-based fishery management systems in South Pacific countries are least likely to be effective where inward migration has diluted customary practices. The situation is pronounced around urban areas where inshore fisheries resources, because of strong market demand and the need for migrants to earn cash incomes, are subject to overfishing.<sup>39</sup> Indeed, it is these fisheries in the region that are most in need of management but which hold the poorest prospect for the implementation of management regimes. Conversely, in rural areas where (i) traditions remain strong, (ii) the impact of social change is moderate, and (iii) populations are homogeneous, the possibility of successfully introducing community-based fishery management systems seem brightest.

Continuing high rates of population and urbanisation growth in the South Pacific is likely to influence the implementation of management measures, traditionally based or otherwise, in the region. While some countries are depopulating (e.g., Western Samoa and Niue), other countries are experiencing population growth rates in excess of 2.5 percent per annum, with little sign of moderation. Moreover, the rate of urbanisation is high, projected to increase in the region by 77 percent between 1985 and 2000, from 1.3 million to 2.3 million (United Nations Development Programme 1990:87).<sup>40</sup> Both population growth and increased urbanisation will further degrade inshore fisheries resources in many locations. The need for measures to promote sustained use is therefore paramount, and community-based management measures will need to address population changes as a primary consideration.

In support of fisheries management measures, particularly in heavily populated areas, promotion of more efficient post-harvest handling and distribution of fish taken in more

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<sup>39</sup> Alternative employment opportunities in urban areas may be available if fishermen have the capacity to make the transition from fishing to another type of work. In this connection, the immobility of fishermen should not be underestimated.

<sup>40</sup> Most growth in urban areas will be in Melanesia, and in particular in urban centres in Papua New Guinea (Port Moresby, Lae, Mount Hagen and Goroka). Suva, Port Vila and Honiara are also expected to experience significant rates of urbanisation. However, perhaps the most intense problems associated with increased urbanisation and sustainable resource use will be in atoll countries, Kiribati, Marshall Islands and Tuvalu. Already these countries are hard pressed to cope with urban problems and environmental degradation and fisheries overexploitation, particularly in Kiribati, are established.



isolated areas of countries in the region. Improvements in handling and distribution should increase supplies of fish to urban areas while enhancing food security and nutrition. Increased flows of fish to urban markets could relieve pressure on inshore resources and thereby reinforce management measures.

In Kiribati, traditional fishing rights and tenure were acknowledged by the British Colonial Administration (Teiwaki 1988:22-43). Traditional fishing rights (including recognition of traditional ownership and tenure, the possibility of registration of tenure and the settlement of disputes) and customary fishing rules (including fines for violations), were contained in the fisheries ordinance and regulation enacted in the 1940s by the administration. These arrangements remained in force until local government councils were established in the 1970s. Councils have authority to establish bye-laws concerning traditional marine affairs but they must be approved by the national government. Teiwaki (a former Minister for Natural Resources in the national government) maintains that in order to promote more effective inshore fisheries management in Kiribati some of the concepts and approaches contained in the colonial legislation should be revived and that island councils should be assigned an active role in fisheries management.

In 1991 the South Pacific Commission (SPC) at its annual technical meeting on fisheries considered the matter of community-based fishery management. A paper by Johannes, Ruddle and Hviding (1991) outlined the importance of such management for the region and proposed a series of research needs. Consideration of the proposed research agenda would enable a realistic assessment to be made as to the possibility of building on community-based approaches to management in the South Pacific. The draft record of the meeting, including recommendations, relating to community-based fishery management are in Attachment 1.

The capacities of national fisheries administrations in the South Pacific to facilitate the implementation of community-based fishery management systems could hinder the rate and extent of introduction. Given the general political will to decentralise in the region, the principal constraints are likely to be (i) difficulties associated with policy reorientation (community-based fishery management is essentially a new concept for administrators schooled in conventional fisheries management), and (ii) the ability to orchestrate such change.

#### 4. ONTONG JAVA: AN EXAMPLE OF COMMUNITY-BASED FISHERY MANAGEMENT

There is an excellent example of a group in the South Pacific engaging in community-based fishery management.<sup>41</sup> Fishing effort and other restrictions are imposed by resource owners in the two major commercial lagoon fisheries (bêche-de-mer and trochus) in the Ontong Java Atoll (also known as Lord Howe Atoll) in the Western Province of Solomon

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<sup>41</sup> I am grateful to Paul Nichols of the South Pacific Forum Fisheries Agency for information provided in connection with Ontong Java. It draws on his long period of first-hand experience in fisheries management in Solomon Islands.

Islands.<sup>42</sup> Being an isolated, low-populated atoll (1,025 inhabitants in 1977), Ontong Java has few resources capable of sustaining commercial development. Most commercial activities centre around copra production, trochus shell collecting and the bêche-de-mer industry, all for export.<sup>43</sup> Since a significant proportion of the atoll's cash income is derived from bêche-de-mer and trochus, the community understands the critical need for fisheries management.

The management measures adopted on Ontong Java are straightforward and easily understood by villagers. In combination, the measures are effective in achieving sustainable resource use and ensuring that the atoll's limited income earning opportunities are protected. Because of communal resource ownership arrangements in the atoll, exclusion of fishermen from commercial fisheries (i.e., effort reduction by limited entry) is not a management option so that other measures must be adopted.

Management measures adopted for bêche-de-mer and trochus fisheries involve (i) closed seasons, (ii) gear restrictions, and (iii) size limits. To permit resource regeneration in inshore areas, each fishery is closed every second calendar year. This ensures the availability of commercial quantities of both resources for harvesting in alternate years while concurrently providing a degree of stability in fishermen's incomes.

With respect to gear, SCUBA and hookah diving equipment are banned in both fisheries. Bêche-de-mer can only be harvested by free-diving from sail or motor-powered canoes or by using weighted spears on strings.<sup>44</sup> Trochus is collected by free-diving or from along the shore-line at low tide. These harvest restrictions are designed to prevent resources in deeper waters from being exploited so that they will be available to repopulate inshore areas in those years when the fisheries are closed. Minimum size restrictions are also imposed in both fisheries to protect juveniles.

Community-based fishery management in Ontong Java has functioned effectively in facilitating sustainable resource use despite pressures resulting from commercial development opportunities. Ultimate responsibility for management rests with village elders, essentially the local government council. It is reported that there is virtually total compliance with communally-adopted management measures since fishermen who fail to comply incur a

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<sup>42</sup> Ontong Java is one of the South Pacific's largest atolls. It is 70 kms long and from 11 to 36 kms in width. Several islands occur around the atoll but most of the population (1,025 in 1977) reside on two islands, Luanua and Pelau. The inhabitants are of Polynesian rather than Melanesian origin (Crean 1977:36).

<sup>43</sup> The commercial bêche-de-mer industry developed in Ontong Java in the late 1930s. Japanese fishermen and traders who visited the atoll taught villagers processing techniques (pre-cleaning, boiling in sea water, gutting and smoke drying) so that the product could be stored between calls to the atoll.

<sup>44</sup> Crean (1977:40-41) describes the use of weighted spears in the fishery.

significant penalty, exclusion from the fisheries.<sup>45</sup> Such exclusion is not only economically crippling for offenders, but it is also socially embarrassing.

The effectiveness of community-based fishery management in Ontong Java has been demonstrated and recognised by the Solomon Islands government. In contrast to Ontong Java's bêche-de-mer and trochus fisheries, communities in the same province and in nearby provinces have not adopted communally sanctioned management measures and have heavily overfished their resources. For example, around Wagina Island the use of hookah, and more recently SCUBA, gear have substantially depleted trochus stocks, even in deeper waters. Similarly, in the Malaita Province, bêche-de-mer resources have been so heavily harvested that they are almost non-existent. Concerned at this situation, one of the largest buying companies of marine products in Solomon Islands (whose owner is from Ontong Java) is urging villagers to adopt community-based fishery management practices in order to promote sustainable resource use.

Three considerations appear to have played an important role in facilitating the successful implementation of community-based fishery management in Ontong Java. These considerations are (i) the relative isolation of the atoll group and little, if any, inward migration, (ii) limited opportunities for income generation and an explicitly recognised need to protect opportunities that exist, and (iii) strong social control resulting from a homogeneous society where many traditions remain intact.<sup>46</sup>

## 5. CONCLUSION

The need for inshore fisheries management in the South Pacific has been recognised for a long time. In traditional societies sophisticated management approaches were adopted in accordance with time-tested modes of operation. Reliance on traditional measures declined in the colonial period with the introduction of centralised systems of administration that did not involve fishermen in decision-making. However, it is now generally recognised that such centralised management systems, scientifically based, have failed to promote inshore fisheries management in the region, despite efforts over the past 40 years.<sup>47</sup> Moreover, Johannes Ruddle and Hviding (1991) point out that few inshore fisheries in the South Pacific are currently managed by government.

The high correlation in developing countries between population growth, poverty and resource degradation has pushed the concept of sustainable development in resource use to international prominence. The need to ensure that renewable resources are not overexploited, and are rationally managed, has led to increased efforts to find innovative solutions for better

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<sup>45</sup> Personal communication with Nichols.

<sup>46</sup> Despite its geographical isolation, Ontong Java has not been protected from the influences of economic development and social change.

<sup>47</sup> Nonetheless, centralised management approaches have been successfully deployed in the industrial fisheries sector (e.g., prawns and tuna) in the region. However, these fisheries involve small numbers of vessels and a high proportion of foreign fishermen.

resource use. In fisheries, as in other natural resource-based industries, attention has focused on increasing the involvement of the principal users, and therefore the major beneficiaries, in critical decisions about how, and at what rate, resources should be exploited. In fisheries, contemporary decisions about resource utilisation and management might be well served, where possible, by building on traditional customs and practices. Such an approach is more likely to be accepted in fishing communities, and give, in the jargon of political scientists, increased legitimacy.

Community-based fishery management approaches have deeply rooted customary precedents in the South Pacific. Although traditional institutions are breaking down, especially as population shifts occur through migration and as the monetary economy more deeply penetrates island societies, efforts to revitalise traditionally-based management approaches might be fostered. Although this will not be an easy task to implement, the challenge for fisheries administrators is to try to implement viable management regimes for inshore fisheries in the face of pressures stemming from continuing social change and rising demand for fish.

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**EXTRACT FROM THE DRAFT RECORD OF THE SOUTH PACIFIC  
COMMISSION'S TWENTY-THIRD REGIONAL TECHNICAL  
MEETING ON FISHERIES  
(NOUMEA, NEW CALEDONIA, 5-9 AUGUST 1991)**

**"AGENDA ITEM 6 - ONE-DAY WORKSHOP: PEOPLE, SOCIETY, AND PACIFIC  
ISLANDS FISHERIES DEVELOPMENT AND MANAGEMENT**

165. Workshop participants emphasised the great diversity of traditional fisheries management practices and associated knowledge across the Pacific Islands, and concluded that most SPC member countries would benefit from comparative studies of these practices and this knowledge. They recommended that the SPC worked towards sharing information on these subjects within and beyond the region, and expressed the opinion that the SPC would be an appropriate vehicle for the publication of issues that would not normally fit in the context of international publications.

166. Participants repeatedly raised the growing problems of reconciling customary law and western law. They agreed on the need for a survey of available information on the various approaches taken by traditional cultures (within and outside the SPC region) to the integration of western laws and traditional customs.

167. Some larger Pacific Island nations contain many customary marine tenure systems about which little is known, and the structures and operations of such systems vary greatly within these countries. Rapid surveys of these systems are needed, especially in order to determine which among them most need further more detailed studies so as to ensure their continued effective functioning.

168. Pacific Islanders' knowledge of their marine environment (including such phenomena as seasonal, lunar and tide related migrations and spawning aggregations of various food fishes) can be of exceptional value to government resource managers. This information is no longer always being transmitted effectively from generation to generation in the region. The workshop strongly supported research efforts to record traditional marine environmental knowledge and, where practical, put it to increased use in government marine resource management.

169. Community-based customary marine tenure and associated traditional management systems are facing a number of widespread modern pressures. The workshop strongly supported research on how traditional marine resource management systems respond to such pressure as major demographic changes, commercialization of marine resources, aquaculture and marine resource enhancement, other coastal developments (including tourism), government marine resource management and enforcement programmes, and to the wider issues of integrated rural development and gender specific roles in fisheries.

170. On a proposal from the Representative of Vanuatu, seconded by the Representative of Papua New Guinea, the 23rd RTMF adopted the following recommendations:

**Recommendation no.8:**

The 23rd Regional Technical Meeting on Fisheries recommended that the Inshore Fisheries Research Programme set up a Special Interest Group on Traditional Marine Resource Management and Knowledge in the SPC region, to provide a focus for collection, discussion and dissemination of information on these subjects.

**Recommendation no. 9:**

The 23rd Regional Technical Meeting on Fisheries also recommended that the Inshore Fisheries Research Project assist, in consultation with member countries and, where appropriate, in collaboration with other regional organizations, in the design and use of customary marine tenure questionnaires, building on the experience of Solomon Islands in their survey of 43 customary marine tenure systems in that country.

171. A full report on this workshop will be appended to the report of the twenty-third Regional Technical Meeting on Fisheries.

**COMMUNITY-BASED RESOURCES MANAGEMENT:  
EXPERIENCES WITH FORESTRY, WATER AND LAND RESOURCES**

by

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**ABSTRACT**

This paper provides a review of the experiences made with traditional community-based management of forestry, water and agricultural land resources. These experiences are of relevance for fisheries because of the commonalities in problems that arise in the management of natural resources exploited jointly by groups or communities of users.

The review is preceded by a brief discussion of collective action theories, in particular the prisoners' dilemma, Hardin's tragedy of the commons and Olson's work on the logic of collective action.

The review is structured in three major sections: the first addresses the physical and technical nature of the resources which either facilitate or hinder collective management; the second analyses the elements of community-based management including organization, rule-making, arbitration and conflict resolution, and enforcement and punishment; and the third discusses criteria for success or failure of the management regime.

The paper concludes with highlighting some features of fisheries which may have contributed to the fact that traditional community-based management regimes have existed or still exist only under specific circumstances in fisheries.



"The rational herdsman concludes that the only sensible course for him to pursue is to add another animal to his herd. And another .... But this is the conclusion reached by each and every rational herdsman sharing the commons. Therein is the tragedy. Each man is locked into a system that compels him to increase his herd without limit - in a world which is limited." (Hardin 1968:1244)

## Introduction

The joint exploitation and management of resources by groups or communities of users is widespread and found in a great variety of natural resources including pasture and grassland, water, forestry, fisheries, wildlife, and common land.

This paper provides an overview of the experiences with community-based management of natural renewable resources in other sectors. It is believed that valuable lessons can be learnt from these experiences because the nature of the problems is very similar to those found in fisheries.

The paper is structured by issues rather than by resources. In this way, it is easier to see the commonalities as well as the differences between different types of resources and of social and cultural settings. The issues have been adapted from an analytical framework developed by Oakerson (1986). This framework comprises four principal components, namely (i) technical and physical attributes of the resources; (ii) decision-making arrangements; (iii) patterns of interaction; and (iv) outcomes or results.

In the present paper, Oakerson's components are discussed within three major sections: the first addresses the nature of the common resources; the second analyses the elements of community-based management including organization, rule-making, arbitration and conflict resolution; and enforcement and punishment; and the third discusses criteria for success or failure of the management regime. These sections are preceded by a brief discussion of collective action theories to facilitate the understanding of problems in group or community-based management of common resources.

## 2. Collective action theories

There exist many situations where gains can be made when people cooperate in fulfilling certain tasks rather than performing them individually. Cooperation among people for some tasks is so essential that they would not be accomplished if there were no cooperation.

In other situations, cooperation by the individual will depend on his/her expectation of the other(s)' behaviour. This is, for example, the case where a renewable natural resource is jointly utilized by a group of users. As the optimal level of exploitation of the resource, say a fish stock, may require restraint by each fisherman in the intensity of fishing, the

benefit of cooperation to the individual fisherman occurs only when all the others also cooperate. If the other fishermen do not cooperate, i.e. defect, the one fisherman who exercises restraint would incur an unreasonable loss in income. In the terms of collective action theory, he would be the "sucker".

Conversely, a single fisherman can maximize his individual benefits if all the others limit their fishing activities while he does not. This behaviour is referred to as free riding or shirking in the literature on collective action.

Early writings on collective action have argued that without an external enforcement authority or group-internal coercion, nobody wants to become the sucker and many would like to free ride. As a consequence, voluntary restraint will not be forthcoming, the resource will be misused or over-exploited and the group will incur losses. The main arguments put forward to support this view are presented in the following discussion on collective action.

### The prisoners' dilemma

The prisoners' dilemma is a parable that illustrates for the smallest possible collective the dilemma between rational individual behaviour and rational collective action. The parable is as follows: two suspects are interrogated about a crime which they have jointly committed. The situation is such that if they both keep silent they will be committed to a light sentence whereas if both confess they will receive a medium sentence. They are interrogated separately and promised to be set free if they confess and serve as witness against the other. The choices of prisoner A, in respect to the unknown behaviour of prisoner B, are, therefore, as follows:

		B	
		Confess	Silent
A	Confess	Medium	free
	Silent	High	light

The rational strategy for A in this situation is to confess which either leads to a medium sentence, or, in the event B keeps silent, to be set free. On the other hand, the optimal collective strategy would be for both to keep silent but individually this entails the risk of a high sentence (Wade, 1986a).

Extended to the use of a natural renewable resource, the corresponding choices of the parable are to (i) cooperate in the controlled use of the resource (i.e. keep silent) or (ii) not to cooperate (i.e. confess, and possibly free ride).

The underlying assumptions of this parable about human behaviour and societal relationships are rather restrictive. One of the assumptions is that each prisoner can choose only once. As a consequence, the dynamic process of learning from repeated experience is excluded (Axelrod 1981 referred to by Wade, 1986a). Excluded is also the possibility of arriving at new or improved rules. As noted by Wade (1986a:9) "one likely rule change is the introduction of penalties for violating agreements" (e.g. the agreement to keep silent).

The prisoners' dilemma and its extensions have become a major analytical framework to study the 'rules of the game' under which people are likely to cooperate in achieving common goals (Runge 1981 and 1986; Platteau, 1992).

### The tragedy of the commons

Hardin's tragedy of the commons<sup>1</sup> refers to the joint use of grazing land and probably comes closest to the situation prevailing also in fisheries. His starting point is a finite piece of grazing land which is open to everyone for exploitation. Each herdsman faces the trade off between the benefit or income he can receive from selling his animals, and the cost incurred from overgrazing the common pasture as the number of animals increases. The key argument, now, is that for the rational herdsman the cost of an additional animal in terms of added overgrazing is shared by all herdsmen while the income from selling an additional animal is purely his. Each herdsman, thus, has an incentive to continue adding animals until the final destination - ruin, is reached (Hardin 1968, Runge, 1986).<sup>2</sup>

Hardin's parable is criticized on primarily two accounts. First, it is argued that - similar to the prisoners' dilemma - Hardin assumes that the individual herdsmen have no information about the status of the pasture and its imminent collapse. Otherwise, it would be against the self-interest of the last herder to add another animal leading to the final collapse of the resource (Wade, 1986a).

Second, it is argued that Hardin fails to distinguish between common property (*res communes*) and open access (*res nullius*) resources. His parable may apply to the latter but not to the former because, as the resource is held and shared by a specific group of people, it is unreasonable to assume that the group would not react to increasing levels of overgrazing by imposing certain restrictions on its use (Wade, 1986a). This critic is supported by studies of traditional management systems, examples of which are presented later on.

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<sup>1</sup>The key message of Hardin's article of 1968 in the journal *Science* was that population control is of utmost importance in a limited world (p. 1248): "The most important aspect of necessity that we must now recognize, is the necessity of abandoning the commons in breeding."

<sup>2</sup>Hardin's tragedy of the commons has received a lot of attention among social scientists, much more than the earlier work by Scott Gordon (1954) who, on the example of fisheries, established the economic theory of a common property resource.

### Logic of collective action

In his publication "The logic of collective action", Olson (1965) has researched the conditions under which people are likely or, alternatively, are rarely to cooperate in the provision of a public<sup>3</sup> or common good. His principal conclusion is that group size is an important determinant for cooperation. In his words, "unless the number of individuals in a group is quite small, or unless there is coercion or some other special device to make individuals act in their common interest, rational, self-interested individuals will not act to achieve their common or group interests." (Olson, 1971:2; emphasis by author).

In a small group, referred to as a privileged group by Olson, "each of its members, or at least one of them, has an incentive to see that the collective good is provided, even if he has to bear the full burden of providing it himself" (Olson, 1965:50; Platteau, 1992).

Olson's reasoning for small groups may not apply if the public good pertains to restraint in the use of a natural resource. There is little incentive for one user to unilaterally limit or reduce his intensity of usage. Only in a situation where one of the users has a disproportionately large share in the utilization of a fully or over-exploited resource, may he derive benefits from unilaterally reducing his intensity of use. However, this situation is rather theoretical because the question may be asked why this individual had increased his rate of resource use in the first instance?<sup>4</sup>

Another situation is where the public good pertains to the exclusion of others from the commons. In this case, it could make good sense for one of the users to cover the entire costs of exclusion (Platteau, 1992). Here, it is also reasonable to assume that the probability of the supply of the public good increases with the degree in inequality of usage of the commons. This is so because the greater is the inequality the higher is the incentive for one group member (the big one) to unilaterally cover the costs of exclusion of outsiders.

In those instances, where the cheapest and most effective form of exclusion requires surveillance and enforcement by the users themselves, the above observation may need to be qualified. The more equitable the distribution of the benefits from the use of the resource, the greater is the incentive for each group member to invest effort in excluding outsiders.

The conclusion that collective action is more likely to occur with small groups could also be supported by the argument that cooperation is much easier to organize and supervise when few people are concerned. Furthermore, relative small groups such as the members of one village are likely to have a wide range of mutual informal agreements or codes of conduct, and corresponding contracting institutions and enforcement mechanisms which, when applied to the production of a new collective good, may incur limited additional costs.

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<sup>3</sup>A public good in the context of Olson's reasoning is one where exclusion from consumption is not possible, for example, a light house that benefits all fishermen.

<sup>4</sup>However, a "big" user of the resource could follow the strategy to temporarily increase his effort to a self-damaging level to drive his co-users into ruin and achieve a position of sole ownership.

In other words, the multiplicity of collective activities within a small group may contribute to 'economies of transactions' in the production of public goods.

In large groups, Olson observes, no one member's action has any significant influence on the provision of the collective good (Olson, 1965; Platteau, 1992). Therefore, nobody has an incentive to come forward voluntarily to make a contribution and collective action is unlikely to occur. This observation could also be qualified by distinguishing between the kind of public good which is being provided. If the public good is restraint in the use of a common resource, Olson's statement is very convincing. For example, applied to a fishery with thousands of participants, the fishing effort exerted by one fisherman has such an insignificant impact on the overall level of resource exploitation that there is no incentive for the individual fisherman to restrain his intensity of fishing.

In the case where the public good pertains to the exclusion of outsiders, it does not appear unreasonable to assume that many of a large group of fishermen might cooperate in keeping large boats out even if this entails some effort (costs)<sup>3</sup>.

In summary, the pursuit of individual gains and the fear of being 'suckered' are the principal reasons why people may not voluntarily cooperate in restraining their use of a common resource. Collective action is more likely to occur in the exclusion of outsiders from access to the resource. Small groups are more likely to cooperate in both, excluding outsiders and restraining resource use.

### 3. The nature of common resources

Different natural resources have different physical and technical attributes which facilitate or hamper their management by a group, community or larger entity. These attributes refer to the degrees of jointness, subtractability and divisibility; the nature of the geographical or physical borders of the resource and the technical requirements to achieve exclusion (Oakerson, 1986).

#### Jointness and subtractability

Originally, the concept of jointness was used to describe the consumption of a public good where no single consumer reduces the value of the good to other consumers<sup>4</sup>. An example is a street light which benefits whoever passes the road and where the use by one person does not subtract from the use by another person. Many natural resources show some degree of jointness in production that is the utilization of the resource by one user does not impair, or prevent, its use by another person. As a variable, jointness refers to different degrees of subtractability (Orstrom and Orstrom 1978, taken from Oakerson 1986).

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<sup>3</sup>As the benefit of exclusion declines with increasing levels of over-exploitation of a resource, the incentive to put in efforts to keep out outsiders obviously also declines. This tantamounts to a vicious circle where over-exploitation fuels further over-exploitation.

<sup>4</sup>The jointness in consumption is the reason why the good should be supplied by the public.

Most natural resources depict subtractability in use that is once one user removes or appropriates a part of the resource it is no longer available for exploitation by another user. This applies, for example, to water, forestry, fisheries, and other natural resources.

The consequences of subtractability are, however, different for different resources. In the case of irrigation water, for example, its rate of replenishment is not affected by the amount of water which is taken out. On the other hand, in the case of fisheries, grazing and tree resources, the rate of replenishment is affected by the amount, timing, and location of harvest. These resources, therefore, are likely to require higher levels of management know how and more complex management regulations.

In the reviewed literature, no distinction is made between physical and economic subtractability. In the case of certain resources, the physical removal of parts of the resource may not influence the economic quality of its other parts. In the case of irrigation water, the quality of the unused water is not affected by the amount of water which has been removed. The same may apply to certain forest resources or grazing land if one disregards increasing transport costs as geographically closer parts of the resource become exploited. However, the situation is different in fisheries where the decline in the abundance of the stock affects its density and, therefore, harvest per unit of effort by all participants in the fishery.<sup>7</sup>

There are examples of resource uses which are not subtractable. All immaterial uses of a natural resource such as watching of wildlife or the admiration of a mountain are non-subtractable<sup>8</sup>. The number of elephants remains unaffected by the number of photographs that have been taken of them by tourists. However, even in these instances there are often complementary needs which show features of subtractability such as the space of a particular spot from where the observation of the animals or the view of the mountain are best.

The influence of subtractability on the users in the exploitation of a resource is not constant over time. In the case of resources that show inter-annual and seasonal variations in abundance, the impact of the amount taken by one user on the availability of the resource to an other user can vary significantly. This feature is, for example, reflected in the arrangements for the use of irrigation water by the Erguita mountain tribe of Morocco . In a year with good rains, the "complicated rules governing the partition of water disappear ..... There are no water allotments to distribute, and no rotations to observe" (Mahdi, 1986:181).

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<sup>7</sup>However, in the case of shoaling pelagic species, the catch per unit of effort can remain constant over a considerable range of effort levels. The implication is that even though the physical abundance of the resource declines with each additional fish caught, the resource is economically non-subtractable until a sudden collapse may occur. In such instances, the fishermen may have no or very limited prior knowledge about the decline in the resource.

<sup>8</sup>Immaterial uses of fishery resources are gaining increasing economic importance, in particular related to tourism. These uses include snorkeling and diving on reef areas and the observation of whales, dolphins and other animals in their natural environments. Among sports anglers it is becoming more common to release the fish after capture.

In the case of community tank irrigation in India, in dry years farmers at the outer reaches of the canal system are excluded by virtue of being located a great distance from the tank (Easter and Palanisami, 1986).

Variability in resource abundance may, indeed, provide for one of the rationales of joint management. In arid range land zones precipitation is low and extremely variable over time and space. The division of the land into individual grazing plots would not only be expensive but would also fail to make optimum use of the available resource as the management area needs to be large enough to internalize spatial variability in rainfall (Artz *et al.*, 1986).

#### Assessment of yields and carrying capacities

The jointness of the resource, and its subtractability, pose the problem of determining optimal levels of exploitation levels. This is a difficult matter for some resources, while for others it is easier. In the case of irrigation, for example, the water available from a tank can be estimated fairly easily after the monsoon rains have terminated.

More complex is the situation with range land because "grazing capacity is not a biological constant, but an abstract management concept": the amount of potential forage is determined by a large number of variables including the species mix; time of planting; climatic conditions; and grazing strategy(ies) (Artz *et al.*, 1986:261).

In the case of forests, there are a large number of different uses, some of which are compatible with each other. Forests are used for its wood (fuel; construction); fodder (grazing); agriculture (swidden cultivation); medicinal plants; sago; honey; mushrooms; etc. In addition to these material goods, certain areas of the forest were traditionally reserved as sacred groves for local spirits or deities. (Mol and Wiersum, 1990).

The great variety of uses has contributed to the fact that forests are "managed" for different products according to the specific needs of its users. In Buthan, for example, a particular forest area is reserved for the exclusive collection of leaves to be used for bedding materials in stables (Mol and Wiersum 1990:16).

The multiplicity of uses provides for some ambivalence in applying the concept of "maximum sustainable yield" to forest resources. Whereas for timber, optimal harvesting schedules and levels are readily calculable, these may not take into account the trade offs between one use and the many other potential uses.

The perception of resource potentials (limits) is often different between external "observers" and the users. A survey in Botswana found "that rural households see grazing land as a seasonally renewable resource, not as a limiting factor (to keep cattle), and they attribute overgrazing to poor rainfall rather than overstocking." (Fortmann and Roe, 1986:167).

## Exclusion

Further to jointness and subtractability, Oakerson's (1986) framework includes the principle of exclusion which is used by economists to distinguish between public and private goods. It originally referred to the ability of the seller of a good to exclude others from using it.<sup>9</sup> The same principle can be applied to the use of natural resources such as fish, forests or water. Physically, it is easier to exclude people from the use of some resources than it is of others. An area of range land can be fenced in, even if it is of a very large size. This is impossible for a migratory fish stock, whereas the exclusion of outsiders from access to sedentary fishery resources in a particular territory of nearshore waters may present fewer obstacles.

The aspect of exclusion is closely related to the problem of determining physical and geographical boundaries for management purposes. The management area of a fish stock or a pool of ground water should include the full physical extension of the resource. This requirement is, however, not necessarily to be fulfilled at hundred percent to achieve beneficial effects from management (Runge, 1986).

The ease of determining geographical boundaries for some resources does not automatically imply that exclusion is easy. Blaikie *et al* (1986:486), for example, noted for small forests in Tamil Nadu, India: "It is extremely difficult to guard and to exclude users from small forests entirely surrounded by rural populations."

In a study on the management of minor forest products in East Kalimantan, Indonesia, Jessup and Peluso (1986:516) note that exclusion is easier to accomplish for a resource whose occurrence is predictable and which is geographically concentrated. Resources showing these features, as a consequence, are more often claimed and owned by specific households.

This is supported by Demsetz (1967) who, in an essay on the development of property rights, concluded that the high value of the products (due to fur trade) and relatively small costs of exclusion were the principal factors why the Montagnes, American Indians inhabiting large areas around Quebec, claimed specific hunting grounds as far back as the early eighteenth century. This did not occur with the Indians of the southwestern plains mostly due to the absence of high value products, but also because the animals of the plains are primarily grazing species whose habit is to wander over vast tracts of land. Forest animals, conversely, confine their territories to relatively small areas and exclusion is easier.

Exclusion is not only a matter of the physical attributes of the resource but also of the available technology. The development of the barbed wire in the last century, for example, dramatically improved the possibility of fencing range land (Oakerson, 1986). For many resources, exclusion technologies have shown considerable improvements with the advent of air and satellite surveillance, and sensing and measuring techniques. However, generally

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<sup>9</sup>In the case of many goods, exclusion is brought about by the destruction of the good when it is consumed. Where this is not the case, problems of exclusion are common (e.g. software; videos; books).



for rural communities in developing countries modern exclusion technologies are frequently too expensive<sup>10</sup>

#### 4. Elements of community-based management

This section presents the different institutions and arrangements for community-based management of natural resources. It is based on studies documented in the literature of, in several cases, traditional management systems which have ceased to exist or are in the process of breaking down due to different causes. Causes include the increasing commercialization of the resources; imposition of centralized administrations; gradual expropriation of resources through emigration of dispossessed populations seeking new livelihoods; and others.

##### 4.1 Organization

Resource management does not occur where there is no institution to establish rules over the use of the resource. In most cases reviewed, the institution comprised some type of organization at the community level, such as a community assembly, council or committee. Where the resource is held in common by users from more than one community, higher level organizations, e.g. tribal council, associations, are common to make inter-community decisions.

These traditional organizations rarely correspond in coverage and membership with modern community organizations imposed from central governments, and may operate in secrecy.<sup>11</sup> In Nepal, Arnold and Campbell (1986) found that in most forest management systems, the traditional user groups were much smaller than the modern village district, i.e. *panchayat*, and sometimes cut across its borders.<sup>12</sup>

The representatives on the councils, committees and associations are usually not elected in a formal voting process but become members due to their social, economic and lineage position in the community, clan or tribe. Wade (1986b) observes for councils with irrigation and grazing management tasks in South Indian villages that their membership is drawn from the dominant caste and the wealthier landowners of the village. In other instances, the council is composed of adult male members from each household, usually the household head.

Frequently, an important election criterion is experience and knowledge, tantamount to age. The traditional management of common grazing lands among the Berbers in

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<sup>10</sup>This may retard the development of clearly defined property rights in developing countries.

<sup>11</sup>McBride (1921, quoted in Campbell and Godoy, 1986:337) observed for the management of common land in the Andes that the village council is the "de facto government of a community, though its operation is so silent and its deliberation so carefully guarded that its existence is seldom even suspected."

<sup>12</sup>The *panchayat* system has a long historical caste-based tradition in South Asia but, in the case of Nepal, was superimposed over pre-existing forms of local and ethnic (non-caste) communal governance (Messerschmidt, 1986).

Morocco's Atlas Mountains was overseen by the *jmaa* or council of the wise men (i.e. elders). The *jmaa*, indeed, was the forum for most of the decisions needed to regulate group affairs. (Artz *et al*, 1986).

The power within these decision-making bodies is not equally distributed among its members and a few members could have an over-riding weight. Campbell and Godoy (1986:337) note for common land management in the Andes: "... the larger landholders do tend to exert a disproportionate influence within village assemblies and dominate the principal village offices." A similar observation is made by McKean for the traditional village assemblies (*yoriai*) in Japan where "the elders (*toshiyori*) tended to make decisions on behalf of the assembly most of the time, and that they themselves came only from the wealthiest 'major' families." (McKean, 1986:551).

In certain instances, sometimes upon the delegation of the community assembly or council, special committees or groups are formed whose sole task is the management of the common resource. Examples include forest management committees in Nepal (Messerschmidt, 1986) or informal water users organizations in South India (Easter and Palanisami, 1986). At times, a large part of the management responsibility is entrusted to a sole person, as with the "chief of grass" in the case of traditional grazing management by the Berber (Artz *et al*, 1986).

In irrigation, where the distribution of water is among the most crucial management decisions, the appointment of special community irrigators is frequent, as the *imazzalan* by the Berbers (Mahdi, 1986) and the common irrigators in South India (Wade, 1986b).

#### 4.2 Rule-making

Several kinds of rules are required to manage a common resource. First, a rule is needed to determine the jurisdictional boundary of the resource. This boundary may or may not correspond with the geographical or physical boundary of the resource. If there exists a significant discrepancy between the two, additional rules are likely to be required to arrange for the sharing of the resource with the neighbouring jurisdictional entity(ies).

Second, a rule is needed to determine who is eligible and who not in the use of the resource. In a dynamic context, there need to be rules for the entry and the exit from the group of users. These rules may, or may not, overlap with the rules governing entry and exit from a community.

Third, rules are required to govern the manner and rate of exploitation of the resource. These may, or may not, include rules of sharing the benefits derived from exploiting the resource.

#### Boundary rules

A rule determining the boundary of a common resource under the authority of a particular community or larger entity requires legitimization at a higher level, and may need to be physically enforced. The reviewed literature provides little information as to how

boundaries have been set, possibly because the event itself would need to be traced back in the dark of history.

For the Erguita tribe, Mahdi (1986) found that each *fraction* (i.e. part of a tribe) is identified with a specific territory whose limits are known and recognized by neighbouring groups. For the uninitiated, the landmarks of territorial boundaries may not be easy to identify while for the users themselves these are part and parcel of the knowledge acquired from youth. Frequently, these marks are reflected in stories or songs which are passed on from generation to generation.<sup>13</sup>

In Zaire, Turnbull (1965, taken from Kisangani, 1986) observed that every band possessed at least several hundred square miles of forest territory for hunting and gathering operations, usually separated by natural obstacles or by the proximity of agricultural tribes. Hunting grounds of particular bands may be marked off by blazing the trees with specific crests (Demsetz, 1967, quoting an anonymous writer).

In the case of fisheries, there frequently exist concepts of territoriality, particularly among small-scale inshore fisheries. These territories may not coincide with the full extent of the range of the fish stock(s) but may indicate locations of higher fish concentrations and thus better catches. Cordell and McKean (1986) identified different types of territory-related tenure in Brazilian inshore fisheries ranging from time-bound net casting claims on migratory species to net fishing spots according to the lunar cycle, and to long-term private property claims on brackish water spawning areas.

### Eligibility

Commonly, belonging to a certain ethnic group, village, or lineage establishes a claim on the common resource. These claims are often permanent and may not need to be relinquished even if the rightholder leaves the village. Artz *et al* (1986), for example, observed among the Berbers that only members of the specific *fraction* had the right to graze the collective, and that, until recently, these rights were maintained even in the absence of the right holder. To date, grazing rights are reserved to those who depend on pastoralism for their livelihoods.

In addition to the group of permanent right holders, temporary access to the resource by outsiders may be allowed in times of unusual abundance of the resource - or in times of unusual scarcity of an alternative resource commonly utilized by them. Such access may be provided on the basis of reciprocity and/or the payment of fees.

Eligibility to participate in the exploitation of a particular resource does not appear to be a major issue of conflict in those instances where the resource is physically concentrated and where recognized (legitimate) jurisdictional boundaries exist. This often

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<sup>13</sup>Since Chatwin's novel (1987), the "songlines" of the Australian aborigines are famous that guide their paths through thousands of miles of wilderness. Similarly, songs containing information on the position of the stars guided Polynesian sailors over vast sea areas.

applies to irrigation water resources in tanks, common agricultural land, and community forests.

In the case of dispersed and geographically extended resources, eligibility may be a cause of conflict. For grazing land in eastern Botswana, Fortmann and Roe (1986:173) note that "who is an insider and who are outsiders to a locality and its land and water is fast becoming the central feature of the conflict."

### Utilization rules

Utilization or use rules often change in accordance with the degree of abundance or scarcity of the resource. The scarcer the resource, the greater is the tendency toward clearly defined rights for each participant in the system. Mahdi (1986) observed in the case of common water resources among the Berber tribe in Morocco, that scarcity of water caused co-owners to carefully oversee the smallest details of water use, and frequently engage in disputes with their neighbours.<sup>14</sup>

In the case of irrigation in India, the rules for tank water rotation are usually activated once the tank supplies are known to be inadequate. Consequently, there is a high correlation between the degree of water scarcity and the level of activity of the informal water users' organization (Easter and Palanisami, 1986).

Referring to traditional management of forests in Nepal, Arnold and Campbell (1986:438) note: "Strong leadership in the locality was found to be important in starting management systems, but the villagers' willingness to participate in cooperative forest management appears to be motivated by perceived shortages of fuel, fodder, and composting material as forest resources diminish." The same conclusion has been drawn by McKean (1986:549) for Japan where "... visible deforestation seems to have made villagers aware of the very real risk of overuse and enabled them to develop and enforce stricter rules for conservation ..."

While perceived scarcity has been one of the conditions for the emergence of traditional management systems, Arnold and Campbell (, 1986:436) note that "effective management systems are to be found only where enough accessible forest remains to enable villagers to meet their fuel or fodder needs by harvesting only in limited periods of the year." This could suggest that once the needs of a growing population have passed a critical level, traditional management rules may become unworkable and break down.

Utilization rules can take many different forms depending on the nature of the resource. They can refer to the type of equipment that is being used in exploiting the resource; areal limits; the time at which the resource can be used; personal characteristics

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<sup>14</sup>Irrigation water is partitioned with the help of different methods including the direct measuring of the water quantity through the placement of a measuring rod in the water basin, or by indirect time-bound means. In the latter case, time is measured in various ways including the height of the sun; the time it takes for a copper bowl with a hole to sink in a bucket of water; or, since modern times, with a watch (Mahdi, 1986).

of the user, and others. Table 1 reproduces a list of control systems applied in traditional forest management. The most common rules are to restrict access to certain times of the year permitting protection and regeneration during the rest of the year, and systems of spatial control to ensure equal access to both nearby and more distant areas to all members of the community (Arnold and Campbell 1986).

**Table 1: Control systems used in traditional forest management**

<u>Basic of Group Rules</u>	<u>Examples</u>
1. Harvesting only selected products and species	<ul style="list-style-type: none"> <li>- Trees: timber, fuelwood, food (fruit, nuts, seeds, honey), leaf fodder, fibre, leaf mulch, other minor forest products (gums, resins, dyes, liquor, plate leaves, etc.)</li> <li>- Grass: fodder, thatching, rope</li> <li>- Other wild plants: medicinal herbs, food (tubers, etc.), bamboos, etc.</li> <li>- Other cultivated plants: upland crops (maize, millet, wheat, potatoes, vegetables), fruit, etc.</li> <li>- Wildlife: animals, birds, bees, other insects, etc.</li> </ul>
2. Harvesting according to condition of product	<ul style="list-style-type: none"> <li>- Stage of growth, maturity, alive or dead</li> <li>- Size, shape</li> <li>- Plant density, spacing</li> <li>- Season (flowering, leaves fallen, etc.)</li> <li>- Part: branch, stem, shoot, flower</li> </ul>
3. Limiting amount of product	<ul style="list-style-type: none"> <li>- By time: by season, by days, by year, by several years</li> <li>- By quantity: number of trees, headloads, baskets, number of animals</li> <li>- By tool: sickles, saws, axes</li> <li>- By area: zoning, blocks, types of terrain, altitude</li> <li>- By payment: cash, kind, food or liquor to watchers or village, manure</li> <li>- By agency: women, children, hired labor, contractor, type of animal</li> </ul>
4. Using social means for protecting area	<ul style="list-style-type: none"> <li>- By watcher: paid in grains or cash</li> <li>- By rotational guard duty</li> <li>- By voluntary group action</li> <li>- By making use of barriers mandatory</li> </ul>

Source: Arnold and Campbell (1986:437)

Traditional utilization rules often have features that contribute to fairness or equality in sharing. For example, one rule in the use of common land in Japan has specified that each household could send only one person for harvesting activities and he/she could only harvest as much as he/she could carry. In those instances, where the nature of the resource required quick harvesting by all villagers, the harvest was equally shared among all households. Rotational access is often provided when the resource shows variability in spatial and/or temporal productivity. Alternatively, access is allotted through chance (Mc Kean, 1986).

Utilization or conservation rules may be derived from religious and archaic beliefs. For example, the opening and closing dates of the *agdal*, the special grazing areas of the Berber, have been supposedly set by a saint over two hundred years ago and are considered sacred (Gilles *et al*). In the case of forest resources, Messerschmidt (1986:469) notes: "... belief systems in which nature is sanctified often function to hold resource abuse in check through some combination of respect and fear that disturbance or neglect of the supernatural may cause more harm than good to the resource and to the people associated with it." Obviously, such rules may become eroded when a group of new users arrives with different faiths.

#### 4.3 Arbitration and conflict resolution

In the management of a common resource conflicts are bound to arise and their intensity and frequency are likely to be closely related to the perceived relative scarcity of the resource. Conflicts can arise due to several factors including (i) absence of a recognized rule; (ii) divergence in the interpretation of a rule; and (iii) outright trespass of a rule. The rule can relate to boundary, eligibility or utilization.

Conflicts over boundaries of the common resource need to be arbitrated and resolved at the next higher level of governance. If this level is absent, forceful resolution could occur. Alternatively, the involved parties could start a process of (re)negotiation to resolve the border disputes.

Conflicts over eligibility can occur because of divergence in the interpretation of the criteria for eligibility or in the absence of clearly defined criteria. A marriage outside the lineage, for example, can result in litigation over the extent to which the in-married or the offsprings can participate in the use of the resource. This kind of conflict may spill-over in the form of retaliatory action on the part of the other lineage. In this instance, arbitration may take place at the next higher level, e.g. clan or tribe.

Conflicts over utilization rules occur principally because of differences in interpretation<sup>15</sup>. Trespasses of the rules may also cause conflicts in situations where word stands against word, otherwise punishment is the norm. Arbitration of such conflicts is commonly done by the institution which established the rule, e.g. community council, committee, association or tribal council.

There is limited information on arbitration and conflict resolution in the reviewed literature. Where there is information, the common observation is that conflicts with outsiders are more frequent than conflicts within the community or group. The low incidence of intra-community conflicts is probably due to the fact that rules are well established, accepted and enforced.

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<sup>15</sup>Divergence in interpretation of a rule is expected to decrease with the length in time the rule is in place

#### 4.4 Enforcement and punishment

Traditional community-based management systems have enforcement mechanisms and forms of punishment, as "no rules are self-enforcing" (McKean, 1986:569). Commonly found are forest watchers (Arnold and Campbell, 1986); detectives; water guards (McKean, 1986); common irrigators (Wade, 1986b); etc. who were either specifically employed by the community for surveillance (and irrigation) tasks, and paid for their services, or the male adults performed them in turns.

It is particularly notable that even in the case of highly rule-abiding Japanese villagers, surveillance and enforcement was seen as indispensable. In the extreme case of exceptional water scarcity, each household would send one male adult to patrol the dikes throughout the night (Shimpo 1976 taken from McKean, 1986).

The community council, or committee, or the council of the wise men (*imaa*), is the institution to decide about sanctions and punishment. Forms of punishment include the confiscation of the harvest; the temporary exclusion from using the commons; and, in the most severe case reported from Japan, the loss of all community rights, i.e. *murajuby* (McKean, 1986).

#### **5. Criteria of success and failure**

The outcome of any form of resources management needs to be assessed on the basis of essentially three criteria, namely (i) efficiency, (ii) equity and (iii) resource conservation. The conservation objective is often realized once a renewable resource is exploited at an economically efficient level.<sup>16</sup>

Few of the reviewed case studies provide information on the realization of the efficiency objective. In some studies efficiency is not specifically defined for the type of resource investigated. In those studies which address efficiency, quantification has been attempted in the case of irrigation (Easter and Palanisami, 1986) but is lacking in other cases due to difficulties in obtaining the required data (some successful systems have ceased to exist) or due to the conceptional problems caused in multiple uses of resources.

Often efficiency is taken as tantamount to conservation which, at least in fisheries, is unsatisfactory. The feature of economic subtractability which prevails in fisheries calls for lower exploitation levels than those needed to maximize sustainable yields to meet the neoclassic efficiency criterion. In the case of rural fishing communities, though, the assurance of minimum income and food levels may be the overriding concern in an occupation that is so dependable on the vagaries of nature.

Most traditional management systems have built-in mechanisms to ensure fairness in the utilization of the common resource, even when considerable economic and social differences exist in the community. Fairness may not imply equity due to the

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<sup>16</sup>Exceptions include very slow growing resources of high value such as certain species of whales and certain kinds of tropical trees.

complementarity in use between some types of privately held resources and the common resource. For example, irrigation water which is divided on the basis of acreage will favour large landholders.

## 6. Conclusion

The results of the reviewed case studies provide clear evidence of the existence of effective systems of traditional community-based management. A precondition for such systems is the awareness of the users about the limits of the resource and the threat of depletion that excessive utilization entails. The emergence of such awareness is not independent from the physical and geographical nature of the resource. It will easily emerge in the case of localized, visible and predictable resources. This applies to specific territorial lots of common agricultural land, community forests, and pasture such as the *agadal* or the Swiss Alps. It most likely also applies to highly visible reef fish resources in the Pacific, and elsewhere.

The emergence of awareness about the limits of the resource is less likely to occur in situations where the resource stretches over vast and seasonally changing geographic areas, is unpredictable and little visible. This applies to range land, most capture fisheries and hunting of many species. The exploitation of these resources entails a significant element of chance for the individual user. The variability in outcome is likely to deceive the users about the abundance of the resource. The "lucky catch" receives more attention than the decline in average results<sup>17</sup>, and the subtractability of the resource is noticed less.

An additional reason for the absence or deficiency in the management of these resources is the problem of exclusion. Excluding outsiders is exceedingly difficult (inefficient) where unpredictability prevails, and physical boundaries move. The internalization of such variability requires to increase the circle of users that need to act jointly. As group size increases collective action is less likely to occur or to be effective.

Management is restraint in use of a resource, and by inference, necessitates the assurance of a certain minimum supply to each participant. If with a growing population, the restraint in use required from each individual jeopardizes his minimum needs, even the best designed management regime will break down.

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<sup>17</sup>The mass (i.e. collective) attraction of lotteries are the few "winners" while nobody bothers about the millions of losers, except each individually.



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**COASTAL AREA MANAGEMENT AS FRAMEWORK FOR  
SUSTAINABLE DEVELOPMENT OF COASTAL FISHERIES:  
INITIATIVES IN SOUTHEAST ASIA**

by

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**ABSTRACT**

Coastal fisheries in many countries are coming under increased stress from the twin pressures of overfishing (from the increasing number of fishers and/or power of their tools) and coastal habitat degradation. Conventional fisheries sector approaches/actions are key elements in addressing these issues. There is increased realization, however, of the need for a more comprehensive framework and scope of action to effectively maintain the functional integrity of the coastal area, in general, and promote the sustainability of coastal fisheries, in particular. This paper attempts to illustrate the potential utility of Coastal Area Management (CAM) as an effective strategic management and planning approach in this context. In this effort, the paper highlights CAM planning initiatives in southeast Asia under the ASEAN-US Coastal Resources Management Project (CRMP) with emphasis on pilot sites in Brunei Darussalam and Indonesia. This is preceded by a background on the concepts associated with sustainable development of fisheries and CAM. Community participation, an essential element for success in CAM planning and implementation, is subsequently discussed within the broader context of institutional arrangements for CAM.

## Introduction

The rapid increase in human population and the scale and intensity of activities to meet their needs have put immense pressure on natural resources and the environment (see Clark and Munn 1988; WCED 1987; Odum 1989). In some areas, the mix of economic activities has placed considerable stress on resource systems that are the very basis of the viability of certain sectors of the economy. While sectoral efforts retain their utility and remain key elements for success, there is increasing realization of the need for more comprehensive approaches to optimize benefits and minimize sectoral incompatibilities and conflicts in development and management (see for example, Folke and Kaberger 1991 and contributions therein). The need for a broader, more effective integration (across coastal to upland areas at the level of local, regional and national development) appears evident given the increasing scale of most sectoral activities and intersectoral impacts.

Of particular concern is the case of fisheries resources and the coastal environment that sustains them. This is in view of the increased number of fishers and/or the power of their tools globally (Pauly and Chua 1988); negative impacts from multisectoral activities and development in the coastal area; and downstream effects of various activities in upland and lowland areas (see Chua 1986; Carter 1988; Chua and Pauly 1989). In certain localities within ASEAN member-countries, for instance, the mix of aquatic/coastal-based (e.g., fisheries, aquaculture, mangrove forestry, tourism) and land-based (e.g., forestry, agriculture, mining, industry, human settlements) economic activities has placed considerable pressure on the coastal area and resources which are the basis of various beneficial uses and sectoral activities (see for example, Chua and Paw 1987, Chua and Pauly 1989, Silvestre et al. 1989).

Measures and/or programs of action within the confines of conventional fisheries sector development and management are of considerable utility and are key elements in response to issues threatening sustainability of fisheries in coastal areas. In the light of recent trends, however, there is a similar realization of the need for a more comprehensive framework and scope of action to effectively maintain the functional integrity of the coastal area, in general, and promote the sustainability of coastal fisheries, in particular. Such is reflected by fisheries literature advocating the treatment of fisheries development as part and parcel of overall rural development, and noting that ultimate solutions to the problems of overfishing and coastal habitat degradation often cannot be found within the fisheries sector itself (see for example, Emmerson 1980; Smith et al. 1982; Pauly et al. 1989; Silvestre et al. 1989;

Fallon and Chua 1980). The evident need for a broader integration is particularly essential in situations of heightened multiple resources utilization and negative impacts in the coastal area.

The present contribution represents an attempt to relate the potential utility of CAM as an effective approach to the evident need for a more comprehensive framework discussed above. In this effort, the paper draws principally from work conducted under the auspices of ASEAN-US CRMP, funded by the United States Agency for International Development (USAID) and executed in six sites within ASEAN member-countries with technical coordination by the International Center for Living Aquatic Resources Management (ICLARM) (see for example, Chua 1988; Chua and Pauly 1988; Silvestre et al. 1989; Chou et al., 1991 for project background and research highlights). In the CRMP experience, the resulting CAM plans allow for effective integration of realities within the coastal and impacting upland areas in the local context, and facilitate subsequent broader integration through the range of local to national level development planning. This paper highlights two case studies drawn from the six CRMP sites to illustrate CAM initiatives for sustainability of fisheries. Presentation of the case studies is preceded by a brief background on the concept of sustainable development of fisheries and relevant issues/problems in the Southeast Asian context, and the CAM concept and framework. Community participation is discussed subsequently within the broader context of institutional arrangements for CAM.

### Sustainable Development of Fisheries

The concept of sustainable development has received much attention lately, given increased concern for erosion of the natural world and its implications on the complementarity in "health" of global natural and human dimensions (Clark and Munn 1988; Svedin 1991). While there is little argument over the rationale and aspirations embodied by the concept as contained, for example, in the Brundtland Commission Report (WCED 1987), considerable discussion has been generated relative to definition, operationalization and contextual features of the concept (see for example, Barbier 1987; SGN 1988; Turner 1988; Pearce et al. 1989; Daly 1990; Svedin 1990). In this paper, sustainable development is used in the context defined in FAO (1991):

... management and conservation of the natural resource base and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations. Such sustainable development...conserves land, water, plant and animal genetic resources, is environmentally nondegrading, technically appropriate, economically viable and socially acceptable.

We note that this definition recognizes, among others, the following essential principles: (1) sustained flow of benefits; (2) functional integrity of the resource system; (3) intra- and intergenerational equity; (4) appropriateness to natural and social sphere/environment; and (5) distinction between growth and development. Daly (1987) delineates the last two elements: "growth [means] ... quantitative increase in scale of the physical dimension of the economy, i.e., the rate of flow of matter and energy [as opposed to development, which means]...qualitative improvement in the structure, design and composition of physical stocks and flows." In this paper, development is taken to mean the quantitative improvements in the benefits from fisheries and/or the process of generation thereof at various levels (i.e., growth is treated as one, although not an indispensable part, of the development process).

The essence of the concept of sustainable development is not new in fisheries management. This is reflected, for instance, in the evolution of its objectives from maximum sustainable yield (MSY) in the 1950s, to maximum economic yield (MEY) in the 1960s, and to optimum sustainable yield (OSY) in the 1970s. Detailed treatments covering these concepts are given, for example, in Gulland (1971), Roedel (1975), Cunningham (1981) and Pauly et al. (1989). Briefly, these concepts are defined below:

- \* MSY is the largest average quantity of fish harvestable from a given fish stock/s on a sustainable basis under existing environmental conditions.
- \* MEY is the average quantity of fish harvestable from a given stock/s that maximizes resource rents under existing environmental and exploitation conditions.
- \* OSY is the average quantity of fish harvestable on a sustainable basis from a given stock/s that results in the greatest benefit to society given the realities (e.g., bioecological, economic, sociocultural, political, technological) of fisheries exploitation.

Evidently, fisheries management has evolved from a purely biological (MSY) to a bioeconomic (MEY) criterion, and to eventual recognition that value to society in the broad sense is the overall goal (consistent with the sustainable development concept). Admittedly, there is far greater understanding of the biological foundations and interlinkages although difficulties remain (see for example, Caddy and Sharp 1988; May 1984); and it is interjection of the social sphere and integration into the broader development frame along the lines of OSY that remain a larger challenge. In view of the foregoing, elements characterizing sustainable fisheries development should include the following:

- \* optimally sustainable benefits from fisheries (e.g., nutrition, employment, etc.);
- \* equitable distribution of benefits (i.e., among various beneficiaries along the production-consumption continuum and between present and future generations); and
- \* none or minimal intra- and intersectoral conflicts or incompatibilities.

In Southeast Asia, issues relevant to the sustainability of fisheries are many and varied, ranging from lack of resource information to inadequacies at the institutional resource governance level (see for example, IPFC 1987; Pauly and Chua 1988; and Pauly et al. 1989 for an extensive listing of various issues). We believe the main issues pertain to the following:

- \* the high number of entrants or fishers and power of their tools, and
- \* coastal habitat degradation.

It is recognized that these key issues (and their solutions) have biological, economic, sociocultural and/or politico-institutional facets without going into the pedantic "chicken or egg" argument. The first of these, for instance, results from increased population pressure, landlessness, unemployment, increased external markets, greater capitalization and/or improved technology, among others.

A key to solution and/or mitigation of the main issues lies in an integrated approach to the problems at their various facets. Requisite integration of different sectoral development programs in a manner that optimizes benefits and minimizes incompatibilities/conflicts is conventionally approached at the level of local, regional and national



development planning. CAM is herein viewed as an effective bridge in the two-way flow process between regional/national development planning and the realities/resource endowments in local coastal areas/communities. The rationale for a broader framework and scope of action within which to interject fisheries sector efforts includes, among others: (1) interlinkages in the natural dimension elements and, therefore, of adverse impacts from sectors outside fisheries and (2) interlinkages in the human dimension sphere (e.g., at the level of institutional/governance arrangements and economic policy). Fig. 1, for instance, gives a schematic representation of some plausible interrelations among fisheries and other components of human and natural dimensions in the coastal area. Note in this context that adopting a broader, multisectoral framework allows, among others, the following: (1) fuller evaluation of impacts on the aquatic resource/environment as a fish production medium; (2) expansion of the scope for feasible management options/interventions; and (3) evaluation of OSY towards which fisheries management goals have evolved.

#### CAM Concept and Framework

The coastal area is commonly defined as the geographical interface or transition space between land and sea. Ketchum (1972) provides an extensive definition covering spatial and functional considerations:

[The coastal area] is the band of dry land and adjacent ocean space (water and submerged land) in which land ecology and use directly affect ocean space ecology [and use], and vice versa. [It] is a band of variable width which borders the continents, inland seas...and [lakes]. Functionally, it is the broad interface between land and water where production, consumption and exchange processes occur at high rates of intensity. Ecologically, it is an area of dynamic biogeographical activity but with [finite] capacity for supporting various forms of human use. Geographically, the landward boundary of the coastal [area] is necessarily vague [varying with the nature of the issues and source of impact/interrelations that are of interest].... Pollutants added to ... a river ultimately reach the sea ....

Operationally, the issue of "geographical vagueness" has been addressed by delimiting the coastal planning area (landward from the 200-m isobath up to 5 km from the shoreline, inclusive) and defining a coastal impact area outside such limits (thereby allowing integration, for example, with lowland/upland use or activities).

Fig. 2 gives a simplified schematic representation of a functional systems framework of the coastal area/resource system embodied by the definition above. The habitat and resource (including fisheries resources) components of the coastal ecosystem are maintained by the various coastal processes to yield goods and services (both environmental/ecological and for direct human use). As previously noted, the coastal area harbors numerous productive resources/habitats (e.g., coral reefs, wetlands, beaches, etc.) whose functional integrity has come under increasing stress or negative impacts. Numerous works detail the nature and elements of the coastal area (see for example, Carter 1988; Goldberg 1978; Caddy and Sharp 1986) and human use or abuse of such in local, regional and global contexts (see for example, Skekielida and Breuer 1978; Englander et al. 1977; Valencia 1979; Soysa et al. 1982; Clark 1985; Clark et al. 1988; Chua and Pauly 1989). In Southeast Asia, the main issues include the following:

- \* highly sectoral approach to development and management;
- \* open access or little restriction on entry to various sectoral/economic activities;
- \* weak policy guidelines; and
- \* poor planning and enforcement.

These issues take the form of the following main concerns in the region:

- \* high extraction/exploitation rate of resources (particularly fisheries and mangroves);
- \* increased conversion activities in the coastal area (particularly for aquaculture, human settlements and urbanization);
- \* increased habitat degradation due to the above concerns and increased pollution (particularly siltation from deforestation, mining and unmanaged land uses and nutrient loading from human settlements, aquaculture and agriculture);
- \* loss of biodiversity (particularly in coral reefs and wetlands); and
- \* sustainability of economic/development path or activities.

A strategic planning and management approach, CAM has developed over the years in response to threats to the functional integrity of the coastal resource system and the sustainability of benefits therefrom. CAM was developed in the U.S. and Western Europe and is rapidly being extended into the developing world. The scope, rationale and principles relevant to the CAM concept and its development have been documented in numerous works (see for example, Clark 1978; CSO 1981; DIESA 1982; Clark 1983; Snedaker and Getter 1985; CAMPNET 1989; Sorensen and McCreary 1990). As the field is relatively new, there is limited familiarity with CAM and related terminologies. As used in this paper, CAM is synonymous with integrated coastal zone management and coastal resources management. Its definition is based on CAMPNET (1989), as follows:

... the dynamic process in which a coordinated strategy is developed and implemented for the allocation of environmental, sociocultural and institutional resources to achieve the conservation and sustainable multiple use of the coastal [area/resource system]....

The goal of CAM, thus, is the sustainable development of the coastal area and resources therein.

Fig. 3 illustrates the flow of benefits from sustainable development of the coastal resource system. Optimum sustainable benefits are the total benefits the community obtains from the goods and services generated by the resource system. Declining benefits occur when the environmental resource base is gradually being eroded. In extreme cases, environmental crises in the form of serious pollution and destruction of habitats may not only lead to negative consequences but also prohibitive costs for environmental repair and restoration.

Fig. 4 gives a simplified schematic representation of the general guiding principle for CAM. Note in this context that humans and their designs (i.e., economic systems/activities) are viewed as a part of, rather than apart from, the ecosystem and the life support it provides (Folke 1990). The complementarity between the human and natural dimensions is emphasized. This means that human systems are dependent on the goods and services produced and/or maintained by the natural life-support dimension, and that the natural dimension elements are dependent on humans for wise use (including technological/institutional innovations) and sustainability. Both dimensions, therefore, are interdependent parts of a whole. In this regard, it is the responsibility and task of humans to forge economic activities consistent with (and as much as possible do not reduce permanently) the capacity of the natural dimension to

yield the flow of necessary goods and services (Folke 1980; Folke and Kaberger 1991).

CAM requires an expanded framework for a broader perspective on the host of issues and realities in the coastal area. Fig. 5 gives a simplified representation of the CAM framework of which the fisheries sectoral framework is a subset. In this context, CAM promotes a multisectoral integration of information relative to (1) the various coastal resources; (2) the processes that sustain them and natural interlinkages; (3) the sectors/activities that impact on the resources and processes; and (4) the socioeconomic/development parameters that influence the scale and intensity of the various sectors/activities. Essentially, thus, CAM requires a fuller understanding of the nature of the problems evident in a coastal area and the plausible management interventions available at various levels that are difficult to discern using sectoral approaches. In this regard, CAM may be viewed as an integrated area development for coastal areas which facilitates subsequent incorporation with regional and national level development planning. Integration components fostered by CAM include, among others, the following: (1) spatial integration that addresses environmental/ecological integrity, optimal resource allocation and coastal to upland compatibility; (2) legal/institutional integration from community to national level; and (3) policy integration relevant to environment and economic development (particularly investments and their impacts).

#### **CAM Planning Initiatives for Sustainability of Fisheries in Southeast Asia**

In 1986, ASEAN-US CRMP was initiated and executed directly by institutions in ASEAN member-countries. Its primary goal was to increase CAM capabilities within ASEAN given the host of degradation issues affecting certain coastal areas in the region. While the full range of relevant coastal issues was of interest, considerable attention was given to fisheries. One site in each ASEAN member-state was selected as a focus of local efforts to facilitate adoption of the CAM approach and strengthen in-country capabilities (Fig.6).

The scope of activities undertaken in each of the six sites is illustrated in Fig. 7. The major thrusts include: (1) publication of a coastal profile to identify CAM issues and information gaps; (2) formulation and conduct of research to more fully characterize the nature of the issues and fill in the gaps; (3) CAM plan formulation and adoption by relevant authorities; and (4) plan implementation,

monitoring/evaluation and eventual incorporation into national development planning. The coastal profiles for the six sites have been completed (see Chua et al. 1987; Paw et al. 1988; Chia and Chou 1988; White et al. 1988; MoManus and Chua 1990; and CRMP 1991), as well as the various biogeographical/technical, socioeconomic and legal/institutional research essential to the planning process (see for example, Chua and Pauly 1988; Silvestre et al. 1989; Silvestre et al. 1992). Activities in the six sites have winded up step (3), largely setting the stage for national agencies to finish step (4).

The CAM plans for the six pilot sites (adopted and to be published by the respective lead government agencies) include, among others:

- \* sustained use/harvest limits for individual coastal resources, cognizant of the natural and human dimension situations;
- \* physical framework plan or elements for the coastal area to optimally utilize both land and sea endowments as well as minimize incompatibilities and conflicts; and
- \* viable and responsive legal/institutional structures (and capabilities) to implement the above.

We highlight below some plan elements with focus on fisheries to illustrate the utility of CAM to provide the framework and scope of action for sustainable development of fisheries.

#### Case Study 1: Brunei Darussalam

Brunei Darussalam is a coastal state in northwestern Borneo Island with a land area of 5,765 km<sup>2</sup> and a 130-km coastline fronting the South China Sea. About 85% of the population (roughly 256,500 in 1990) lives in the coastal area and almost all social, cultural and economic activities are concentrated here. The country's economy has been largely dependent on the exploitation of petroleum hydrocarbons since the late 1920s. In the last 15 years, over 95% of exports and 58-88% of gross domestic product have been accounted for by the dominant oil and gas sector. Aware of the uncertainties associated with large dependence on a single, nonrenewable commodity, the government of Brunei Darussalam has embarked on a broad-based strategy to diversify its economy. These efforts have accelerated particularly in the last decade.

The government of Brunei Darussalam has taken interest in CAM in the light of regional trends and the potential pressure from development activities accompanying economic diversification. Brunei Darussalam is in a favorable position to promote sustainable development of its coastal resources. The dominance of the oil and gas sector has resulted in comparatively less pressure on its coastal resources in general. Problems in the coastal area exist, however, and potential impacts are many, given the country's development path.

Full participation of Brunei Darussalam in ASEAN-US CRMP began in early 1987. Project activities were coordinated by a National Steering Committee (composed of representatives from various government departments) with technical assistance from ICLARM. In late 1987, the coastal environmental profile of the country was published (Chua et al. 1987) and followed up by various studies to clarify the nature of the issues and fill in information gaps. Priority studies included, among others, the following:

- \* fisheries resource assessment;
- \* assessment of mangrove resources;
- \* evaluation of artificial reefs for fisheries enhancement;
- \* water quality baseline assessment;
- \* evaluation of the legal/institutional framework for CAM; and
- \* socioeconomic significance of coastal resource use.

Results of these are documented in Silvestre et al. (1982).

Brunei Darussalam has a long fishing tradition and one of the highest per capita consumption of seafoods in Southeast Asia (over 40 kg/person/yr). In 1985-1988, the average quantity of fresh fish marketed in the country was about 4,600 t/yr (B\$28.5 million), of which about 2,000 t (B\$11.5 million) were from local production. About 600 full-time and 1,600 part-time fishermen were engaged in artisanal fishing during the same period. They fished in nearshore coastal waters, principally within the 40-m depth contour, particularly within Brunei Estuary. A total of 1,400 units of net gear, 2,300 hooks and 1,700 traps were licensed annually to operate in the country during the 1985-1988 period. Industrial fisheries consisted of 12 inboard-powered vessels in 1990; 8 were engaged in trawling and 3 in purse seining. About 20% of fresh fish produced and marketed locally comes from the industrial sector. Accelerated expansion of the industrial sector, however, is programmed in view of : (1) the decline in artisanal fisheries manpower due to land-based economic opportunities; (2) considerations

of food self-sufficiency and food preference of the populace; and (3) overall economic diversification.

Results of assessment studies indicate potential yield (MSY) estimates of about 25,700 t/yr from the continental shelf area consisting of 500 t of shrimps under average rainfall conditions, 15,400 t of demersal fishes, and 8,800 t of small and large pelagic fishes. The issues affecting fisheries include the following:

- \* overexploitation of the shrimp stock/s;
- \* growth overfishing of resources from intensive artisanal activities within Brunei Estuary;
- \* underutilization or discarding of low-value demersal fishes;
- \* proper development of industrial fisheries that ensures safety or unhampered operation of offshore oil facilities and minimal conflict with artisanal fishermen; and
- \* institutional constraints and actual/potential coastal habitat degradation.

Effort and gear control measures (i.e., zonation of individual gear type deployment) have been proposed and adopted by the government together with promotion of value-added fish processing activities in response to the first four issues. The last, however, pertains to the host of issues affecting fisheries sustainability in the coastal area whose solutions lie outside the sector itself. Fig. 8 gives a schematic representation of a systems framework of the complex issues/problems affecting the coastal area of Brunei Darussalam, and some causes/reasons and management actions proposed under the CAM plan for the country. Evidently, a CAM frame allows a more effective scope of action for sustainable fisheries development.

The programs and projects adopted under the CAM plan for Brunei Darussalam are summarized in Fig. 9 together with institutional responsibility for their implementation. An important component of the plan is the integrated zonation scheme to minimize conflicts/incompatibilities of sectoral activities. Fig. 10 gives some elements of the zonation scheme. Some of its features important to fisheries include, among others: (1) provision of 1-nm "no fishing" areas around oil industry structures and reef areas; (2) concentration of pollutive industries in one area/zone for centralized waste treatment; (3) maintenance of forest cover; and (4) managed utilization of mangrove resources. Moreover, the Brunei Darussalam CAM plan adopts a coordinated implementation of the various programs and

projects via the organizational structure illustrated in Fig. 11.

#### Case Study 2: Segara Anakan, Central Java, Indonesia

Segara Anakan Lagoon is a semi-landlocked brackishwater embayment located in the southern coast of Central Java, Indonesia (Fig. 12). Three major rivers discharge into the lagoon - Citanduy, Cibeureum and Cikujang, the former being the major source of sediment and freshwater influx. Sediment influx into the lagoon, about  $1.3 \times 10^8 \text{ m}^3$  annually, is due to improper watershed land use and natural causes. As a result, the water surface area of the main part of the lagoon has decreased from 6,400 ha in 1900 to about 2,700 ha by 1986.

The Segara Anakan basin comprises an area of 96,000 ha with about 8,150 ha of water area and 24,350 ha of mangrove/tidal swamps. The mangrove forest in Segara Anakan is the largest extant in Java and economically important for the subsistence communities in the area. Three villages in Segara Anakan and 8 subvillages collectively known as Kampung Laut had a combined population of 7,840 in 1988. About 80% of the population is dependent on fishing. Majority are below the national poverty line of US\$100/capita/year.

The lagoon is ecologically important as feeding and nursery grounds for shrimps as well as fishes. The penaeid shrimps, for instance, spend part of their life cycle in the lagoon and migrate offshore to mature and spawn. Thus, the lagoon supports a viable offshore penaeid shrimp resource generating an exportable catch of about 1,000 t/yr. Since the trawling ban which began in 1980, the offshore shrimp catch appears to be underexploited. Lagoon fisheries, on the other hand, generate a gross revenue of US\$350,000 or over 900 t/yr of juvenile shrimp. Shrimps account for 60% of the total fisheries catch in the lagoon. Four types of fishing gear are commonly used in the lagoon - trammel nets, tidal traps, push nets and traps like *wadong* and *pintur* (Fig. 13). The tidal traps are dominant with a monthly average catch per unit effort (CPUE) of 15 kg/trip. Overall, tidal traps contribute 73% of the total catch in the lagoon.



The main fisheries issues are the following:

- \* use of traditional fine-meshed (about 4 mm) mobile and set gear, resulting in primarily juvenile shrimp and fish catch in the lagoon;
- \* exceeded MSY of 605 t/yr for lagoon-fisheries current shrimp catch is 900 t/yr;
- \* decreasing CPUE for the lagoon fisheries; and
- \* poor income of fishing communities.

The issues facing the fishery sector are part of the larger management issues affecting the whole of Segara Anakan, as follows:

- \* high discharge of sediments into the lagoon resulting from poor upland agricultural practices, inadequate flood control measures and natural causes;
- \* enormous silt load that causes the decreasing size of the lagoon;
- \* agricultural runoffs, potential pesticide and heavy metal pollution including domestic waste discharge into the lagoon;
- \* improper utilization of the mangrove forest;
- \* loss of mangroves and tidal swamplands which support traditional fisheries due to harvesting and conversion to paddies;
- \* declining socioeconomic or livelihood status of the poor inhabitants of Segara Anakan; and
- \* legal, institutional and administrative constraints such as land ownership disputes, lack of coordination among concerned agencies and legal barriers.

The above management issues have been identified and evaluated through workshops and research projects undertaken over a span of 2 1/2 years between 1986 and 1990 involving more than 15 institutions at the local and national levels. Biogeographical, socioeconomic, legal and institutional

studies were conducted to collect baseline information on the present status of Segara Anakan, its resources and inhabitants (see Chou et al. 1981). The information derived from these research projects is the basis for formulating a management plan for Segara Anakan.

The planning process essentially follows that used in the other ASEAN member-countries. Of course, there are some different elements. For example, the planning groups involved are members of local agencies headed by the district chief of Cilacap known as *Bupati*. Technical and planning assistance comes from the lead implementing agency of CRMP, coordinated by the Directorate General of Fisheries.

The outcome of the planning process is the integrated management plan for Segara Anakan-Cilacap (IMPSCA). The goal of IMPSCA is to manage Segara Anakan for sustainable development, maintaining its ecological functions as feeding and nursery grounds for living aquatic resources (especially shrimps) and minimizing resource-use conflicts. Table 1 gives a comprehensive summary of the strategies and actions formulated to address the problems facing the lagoon. The sustainability of the fishery sector will be compromised if other issues are not addressed adequately. The issues on sedimentation, water quality degradation and lack of alternative livelihood, for example, will have great bearing on the function and integrity of the lagoon. This in turn will have important implications on the long-term viability of fisheries and the economic well-being of the Kampung Laut residents dependent on it.

Some of the strategies and actions listed in Table 1 are translated into projects while others are being addressed at the policy level. For example, some policies deal with the sedimentation problem such as conducting a feasibility study of the proposed schemes by MPWS, including an EIA. Projects have been proposed to manage and protect the lagoon and improve the quality of life of Kampung Laut residents (Table 2). These deal with the following:

- \* aquaculture as an alternative livelihood activity;
- \* fishery management of the lagoon;
- \* marketing of fishery products;
- \* involvement of women in alternative income-generating activities;
- \* education and public awareness on resource management;
- \* wetland management and conservation; and
- \* water quality of the lagoon.

Another feature of IMPSA is the proposed zonation scheme approved by the concerned agencies. Its importance is to maintain the ecological function of the lagoon; to manage and conserve the mangrove areas for sustained silviculture and as wildlife habitat; and to designate areas for development, settlement and agriiculture including areas for fishing and aquaculture. Some elements of the zonation scheme are illustrated in Fig. 12.

### **Institutional Arrangements and Community Participation**

Sorensen and McCreary (1990) define institutional arrangements in the context of CAM as the "composite of laws, customs, organizations and management strategies established by society to allocate scarce resources and competing values." A country's arrangement for national governance becomes more complex as its level of socioeconomic development increases. Such complexity is brought about by the sectoral or functional differentiation of the various institutions operating within the coastal zone. In Japan, for instance, Osaka Bay is managed by three agencies: Ministry of Transportation at the surface, Ministry of Communications at the bottom and Ministry of Agriculture, Fisheries and Food at the column (Shapiro 1984). Further complication is also created by hierarchical differentiation of agencies such as federal (national), state (provincial) and local (municipal or village) levels.

In essence, there is no textbook answer to the type of institutional arrangements that should be adopted or developed for CAM. However, Sorensen and McCreary (1990) have come up with two generalizations. First, an array of management strategies and institutional arrangements are available to help allocate coastal resources among competing and conflicting interests. Second, the institutional arrangements and management strategies must be tailored to the needs of each individual coastal nation in the light of such factors as the issues and problems involved, political traditions and technical capabilities.

There are three elements of choice in formulating an institutional arrangement. These are the degree of permanence, the sharing of decisionmaking responsibility and the scope of participation. In CAM, participation involves both individuals and organizations. The element concerning participation, particularly by the general public, has long been recognized as an essential ingredient for success. Conceptually, CAM (except perhaps in the shift of geographical focus) is almost identical with the integrated rural development (IRD) approach. Grass roots participation is one of the six key elements of IRD (Garcia and Cabrido 1982). The success stories in IRD have had strong community participation.

The US is among the pioneering countries which emphasized the need for public support in CAM. Its own experiences have revealed that unless public support and understanding exist for CAM, long-term goals of such an effort will not be achieved (Knetoh 1981). But public participation is not simply involving the people at large in formal gatherings, the common method being employed by developed nations. In fact, some successful cases of public participation in CAM have been undertaken outside the formal forum. In American Samoa, people discuss problems in the village council with their *matasi* (village chiefs) and each *aiga* (extended family) arrives at a consensus (Templet 1987).

Fig. 14 shows a continuum of public participation in institutional arrangements for coastal conflict resolution and the type used as incorporated in the CAM plans for the various ASEAN/US CRMP sites. The array of institutional arrangements ranges from a highly centralized one to a more devolved or democratic form. The left section shows that participation is practically limited. It relies more on the decision of an individual or a small number of decision-makers. As one goes to the right, more actors and users of coastal resources get involved. It draws on a broad set of representatives from the government, the private sector and NGOs. Choosing an appropriate level of participation necessarily entails value judgement and, more importantly, trade-offs. In many fishery areas of the tropics where there are multiple uses and conflicts, the participation of the fishermen in the decisionmaking process must be heightened. Appropriate avenues must be explored so they could actively participate particularly in the choice of management objectives and development interventions. Smith et al. (1983) have strongly argued for the eventual active devolution of some decision processes to the fisherfolks themselves for more effective management.

In public participation for CAM in the ASEAN context, the fundamental questions of why, who, when and how largely remain. The why question or rationale is highlighted by Renard (1986) who argues that in citizen participation, "people are not the object but the subject of development and the makers of their own history." People need to participate for the very reason of survival; the fishery having often been referred to as the employer of last resort. Hence, the fisherfolks must have a say in the management of the resource base for their livelihood. Citizen participation is also encouraged in CAM to ensure that the people's real needs and priorities are addressed. Community participation also promotes the integration of local knowledge into the planning process and provides the appropriate feedback for monitoring and evaluation of various development interventions.

Another important issue is who should participate. Theoretically, all should join because everyone has a stake on the coastal resources and environment. But in reality, not everyone can be involved because participation is dictated to a large extent by the existing political structure, traditional practices and even the general level of economic development. Hence, even within ASEAN, public participation takes different modes (Fig. 14). Moreover, the top-down approach, while maintaining sufficient public consultation, is suitable in Brunei Darussalam, Malaysia, Indonesia and Singapore while a bottom-up approach is seen fitted for the Philippines and Thailand where communities play more active roles (Chua 1989). The question of when to participate is also situational, depending on what is desired out of the exercise. If more commitment is envisioned, for instance, it is best to involve the public at the onset of the planning process. There is also a middle ground arrangement where key representatives participate at selected CAM planning and implementation stages.

The question of how involves both the method and level of participation. The most common forms are regional or in-country workshops and symposia. It may even take the form of person-to-person contact. The level of participation required is partly dictated by this question: Who pays and who benefits? One pervasive myth in community participation is that all who get involved will be benefited. This is not necessarily true because as Whitehead (1976) has pointed out: "No single policy or proposal can equally advantage all the sectors and factions that make up the community; indeed what benefits one group can, and will, disadvantage others."

There is also the lingering question of whether or not public participation will or should actually lead to the so-called community-based management. Fishery resources may be categorized as common property that cannot be subjected to the usual private appropriation due to their inherent characteristics. Community-based management is essentially synonymous with common property management. Under this set-up, an identifiable community exercises use rights and manages the resource. The community formulates and enforces rules concerning who may and may not use the resource, and how it is to be used (Berkes and Farvar 1989). It is the common ownership of the resource that imbues the community with a self interest to bear the cost of management. In the context of institutional arrangements, the government can strengthen the community-based management. It may provide the necessary legal sanction and the appropriate zonation scheme. During the early phases of community-based management, the government must play a supportive and supervisory role until such time that the community is able to fend for itself. This arrangement is referred to as co-management.

Through the six-year experience of ASEAN in CAM, several DOs and DONTs may be generalized about community participation. Appropriate recognition of this may save important logistics and manpower resources. Citizen participation must be encouraged when there is a fairly high level of literacy and civic consciousness. It is also likely to succeed when traditional use rights are commonly practised. The support of the political leadership and other sectoral leaders must be solicited at the onset and maintained throughout. It should also be emphasized to the public that community empowerment has accompanying responsibility and governance.

Under certain conditions, however, public participation must be restrained. A public forum should never be used when people are not yet fully aware of the CAM issues and consequences involved. Nor should it be introduced when the political, social and cultural climate does not favor direct public consultation; such a move may even endanger the entire CAM initiatives. At the initial stage of planning, the community must not be overmobilized or consulted to avoid unnecessary expectations and minimize intrigues. There should also be no selling of "pre-made" decisions when consulting people. Let ideas come in a two-way direction: from the planners/resource managers and the people themselves.

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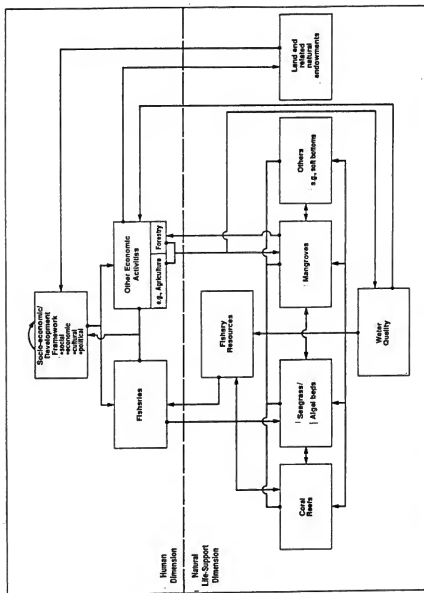
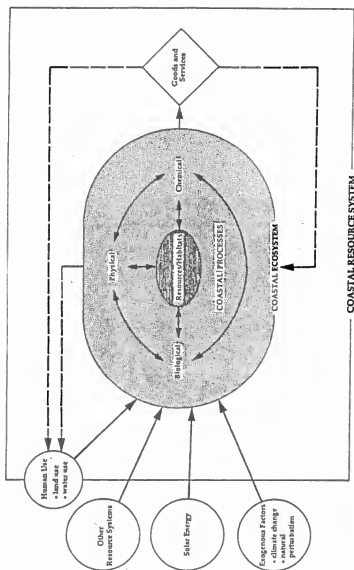


Fig. 1. Schematic representation of interrelations among fisheries and other components of human and natural dimensions.



Legend:



Input



Output

Coastal Ecosystem (Throughput/Conversion Process)

Environmental Limit

Feedback Loop

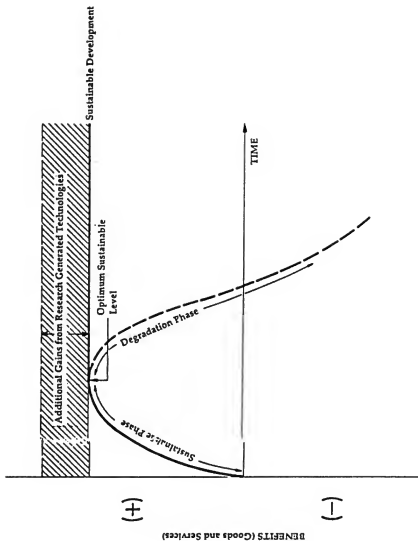


Fig. 3. The flow of benefits from sustainable development of the coastal resource system.

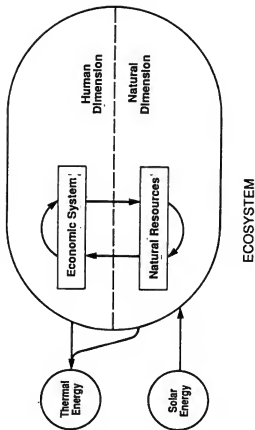
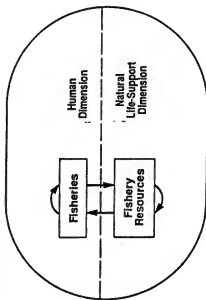


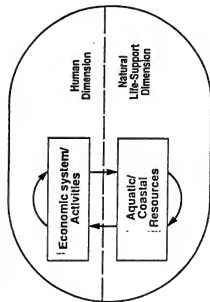
Fig. 4. Schematic representation of principle for an ecological-economic management perspective of an ecosystem (adapted from Folke 1990).

a. Sectoral framework



Fishing System

b. Multisectoral CAM\* framework



Coastal Resources/Area System

Fig. 5. Conceptual framework for addressing fisheries development/management from a sectoral (a) to a comprehensive, cross-sectoral (b) perspective. Arrows originating from and leading to the same box indicate interrelations between components within the box.



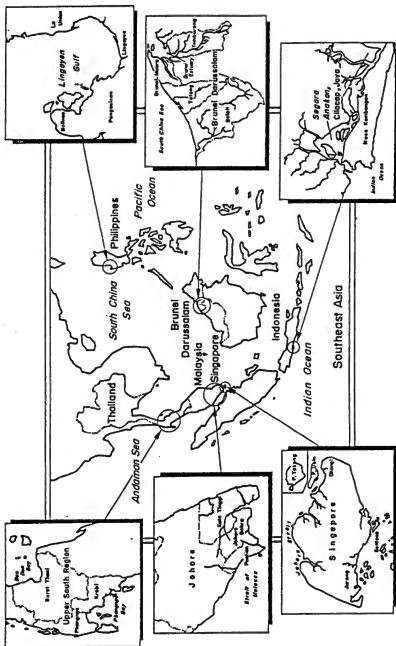


Fig. 6. CAM pilot sites under the auspices of ASEAN/US CRMP.

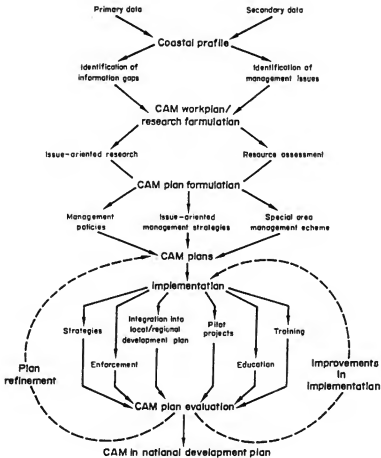


Fig. 7. Scope of activities and major thrusts in the six pilot sites under the auspices of ASEAN/US CRMP.

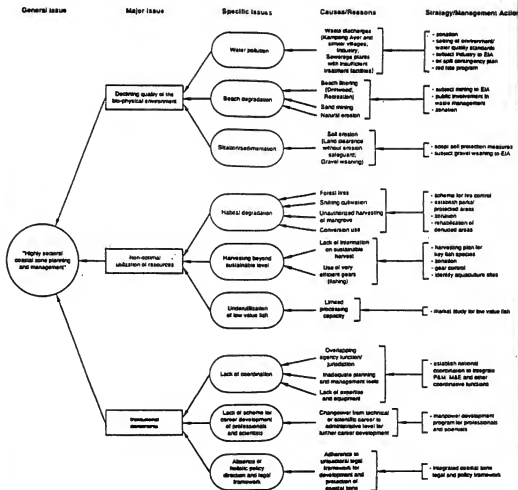


Fig. 8. Systems framework of management issues/problems in the coastal area of Brunei Darussalam together with strategies or management actions to address them as proposed in the CAM plan for the country.

Programs/Projects

Governmental Agencies

A. Water Quality

Management Program

1. Classification standards

2. Soil erosion

3. Solid waste disposal

B. Fishery Management Program

1. Action Plan for the IF:

(a) shrimp

(b) finfish

(c) demersal, and

(d) pelagic

2. Zonation

C. Aquaculture Management Program

1. Market study; low value fish

2. Identification of suitable sites

D. Mangrove Management Program

1. Zonation

2. Monitoring/research

E. Coastal Land/Forest

Management Program

1. Fire control

2. Rehabilitation

F. Island Management Program

1. Classification

2. Zonation

G. Coral/Artificial Reefs

Management Program

1. Guidelines on exploitation

2. Establishment of artificial reefs

3. Monitoring/research

4. Sports fishery promotion

H. Red Tide Program

I. Oil Spill Program

J. Transnational Tie-up Program\*

K. Public Awareness Program

L. Support/Auxiliary Programs

1. EIA

2. Integrated zonation

3. Monitoring and evaluation

4. Manpower development

5. Coordination/planning

	MIPR		MOD			MOE	CA
	FISH	FOR	PWD	TCP	MD		
A. Water Quality Management Program							
1. Classification standards			x				
2. Soil erosion			x				
3. Solid waste disposal			x				
B. Fishery Management Program							
1. Action Plan for the IF:	x						
(a) shrimp							
(b) finfish							
(c) demersal, and							
(d) pelagic							
2. Zonation	x						
C. Aquaculture Management Program							
1. Market study; low value fish	x						
2. Identification of suitable sites	x						
D. Mangrove Management Program							
1. Zonation		x					
2. Monitoring/research		x					
E. Coastal Land/Forest Management Program							
1. Fire control		x					
2. Rehabilitation		x					
F. Island Management Program							
1. Classification				x			
2. Zonation				x			
G. Coral/Artificial Reefs Management Program							
1. Guidelines on exploitation	x						
2. Establishment of artificial reefs	x						
3. Monitoring/research	x						
4. Sports fishery promotion	x						
H. Red Tide Program	x						
I. Oil Spill Program					x		
J. Transnational Tie-up Program*							
K. Public Awareness Program						x	
L. Support/Auxiliary Programs							
1. EIA							x
2. Integrated zonation							x
3. Monitoring and evaluation							x
4. Manpower development							x
5. Coordination/planning							x

Legend:

MIPR = Ministry of Industry and Primary Resources

MOD = Ministry of Development

FISH = Fisheries Department

FOR = Forestry Department

TCP = Town and Country Planning Department

PWD = Public Works Department

MOE = Ministry of Education

MD = Marine Department

CA = Coordinating Agency

\* = To be determined

Fig. 9. Proposed classification of programs and projects by agencies in the Brunei Darussalam CAM plan.

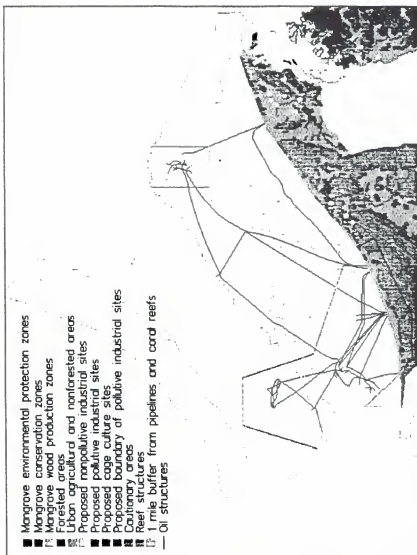


Fig. 10. Some elements of the zonation scheme in the coastal area of Brunei Darussalam.

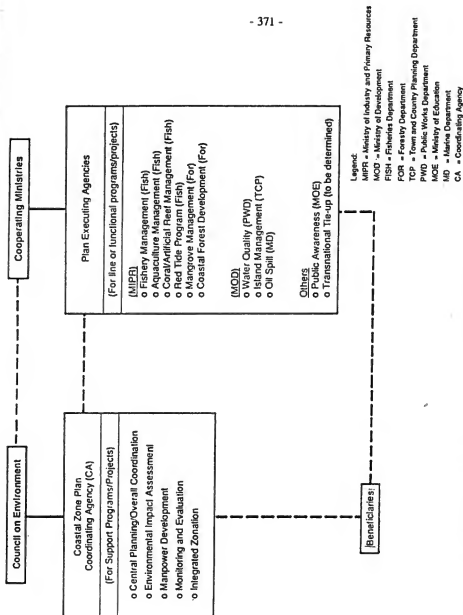


Fig. 11. Organizational structure for the management of the coastal area of Brunei Darussalam.

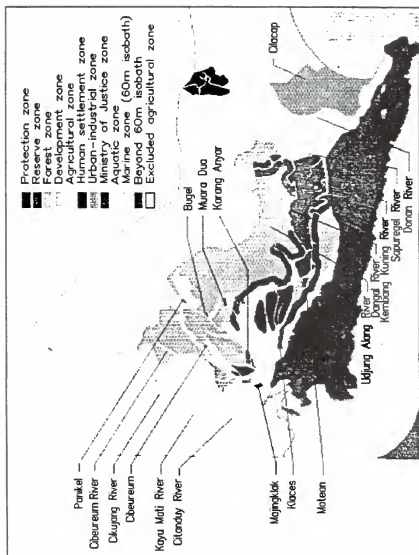


Fig. 12. Segara Anakan Lagoon and some elements of the zonation scheme based on the CAM plan for the area.

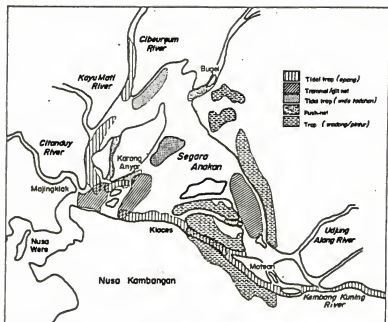


Fig. 13. Operational ranges of the various fishing gear used in Segara Anakan, Indonesia.



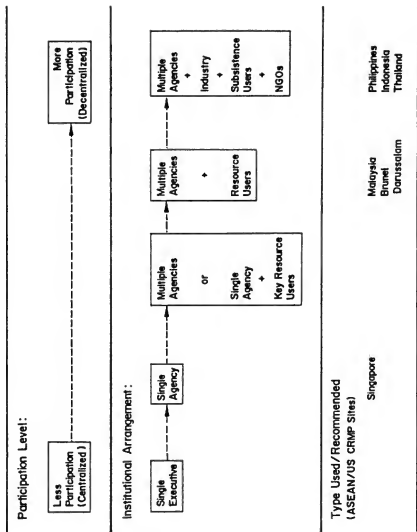


Fig. 14. A continuum of participation in institutional arrangements for coastal conflict resolution (adapted from Sorensen and Mc Creary 1990).

Table 1 Summary of management issues, problems, strategies and actions for implementation under the IMPSA.

Issues/problems	Strategies and actions
Resource degradation Coastal forest depletion and land use conflicts	Implement zonation scheme and set up Segara Anakan Task Force (SATF)  Establish management criteria and guidelines for seven zones Mobilize Kampung Laut residents to participate through field workers Monitor management and refine plan
Declining returns from fisheries and catching large amounts of juvenile shrimps	Reduce fishing effort in lagoon, eliminate fine meshed nets and transfer some fishermen offshore Draft and approve regulations to support the plan Communicate new regulations to villages by field workers Identify village management committees Set up pilot aquaculture projects
Water quality degradation	Establish permanent monitoring stations and determine sources of pollution through local agencies Establish sub-committee on SATF to coordinate water quality control Identify monitoring/research agency and laboratory Encourage self-enforcement among large companies near Cilacap Use village management committees to regulate local domestic waste and to improve drinking water supply
Sedimentation of the lagoon	Implement pilot projects for agitation dredging proposals or variations thereof as soon as possible through the Ministry of Public Works (MPW) Refine terms-of-reference for testing operations to be complementary with IMPSA and establish long-term cost/benefits
Socioeconomic and livelihood Poverty, poor health and lack of livelihood options	Expand and support the existing Bupati socioeconomic program, further develop viable alternative livelihood options such as offshore fishing, marketing, aquaculture, agriculture and women's projects Test feasibility of tourism and handicrafts Encourage family planning
Legal, institutional and administrative framework Inadequate clear jurisdictions of land control No clear institutional mandates No cross-sectoral cooperation Inadequate planning and management skills	Clarify jurisdiction over land and management roles Form a SATF Hold regular meetings among SATF members Draft arrangements and/or changes in policy about management of land and resources; endorse plan Train local and regional government personnel Provide information and consultation to agencies through SATF as needed
Education and public awareness Poor formal education for communities Low public appreciation of resources Poor local participation	Conduct seminars and nonformal education on resource management and conservation Incorporate resource management into the formal school curricula of Kampung Laut Highlight economic role of resources Encourage locally formed management committees to take responsibility in resource management

Table 2 Summary of projects for implementation under the IMPSA.

Project title	Priority
	First
1. Implementation of SATF and coordination of plan activities in Cilacap.	Needed to implement other projects
2. Delineation of the zonation boundaries for Segara Anakan mangroves and land area	Needed to begin land use management
3. Training of Kampung Laut residents in the culture of crab, fish and related aquatic species	Needed to begin income generation to relieve fishing pressure
	Second
4. Reduction of fishing pressure on the lagoon fishery	Will provide fishery management
5. Improvement of crab and fishery commodity marketing channels and training in marketing cooperatives	Will enhance income as crab production increases
6. Involvement of women in alternative income-generating activities	Will enhance income
7. Education and public awareness on resources management and ecology in Kampung Laut	Will support implementation and project success
8. Improvement of wetland management and conservation in Segara Anakan	Will begin management of core zone
	Third
9. Monitoring of water quality in Segara Anakan for long-term management and training of local personnel	Will begin long-term monitoring of environment

## ICLARM TECHNICAL REPORTS ON COASTAL AREA MANAGEMENT

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